Building the New Economy

"Implementing the InfoComm Revolution

in the National Capital Area"

"Building the New Economy: Implementing the InfoComm Revolution in the National Capital Area"

A study of the Information and Communications Industries and their role in the region

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The New Economy in the National Capital Area

■ In 1998, PricewaterhouseCoopers LLP on behalf of the Potomac KnowledgeWay, conducted a study to analyze the Information and Communications Cluster and trends in the Internet related industry segments underlying the development of a New Economy in the National Capital Area. The study was cosponsored by Hale and Dorr LLP, the Greater Washington Initiative, and Virginia's Center for Innovative Technology.

■ That study provided the first quantitative confirmation of the growth of this sector and the way in which it was transforming the region in and around Washington D.C. from one focused on the Federal Government to an innovative center of emerging technologies.

■ This study revisits the issues identified in 1998, updates the data examined then, and analyzes new trends that, despite the recent downturn, have turned the National Capital Area into one of the top regions in the country for high technology innovation and employment.

Industry Scope: The InfoComm Cluster	The Information and Communication (InfoComm) Cluster includes three industry sectors with complementary and often interdependent products and services: Communications, Content, and Computers/Systems Integration, with Internet services and products embedded in all of them.
Geographic Scope: The National Capital Area	**Washington, D.C.**; the **Maryland counties** of Howard, Prince George's, Montgomery, Anne Arundel, Frederick, Baltimore, Charles and Calvert and the **City** of Baltimore; and the **Northern Virginia counties** of Loudoun, Fairfax, Prince William, Arlington, Fauquier, Stafford, and Spotsylvania, along with the **cities** of Alexandria, Fairfax, Falls Church, Fredericksburg, and Manassas.
Evaluation Scope:	Quantifying current status and qualitatively assessing emerging trends and the impact of the InfoComm economy on the region.
Approach:	**Primary research:** including **fax surveys**; **interviews** with industry and regional thought leaders; **roundtable** discussions with executives from emerging companies in the region; and **secondary research.**
Sponsors:	**District of Columbia**, *Office of the Deputy Mayor for Planning & Economic Development*; **George Mason University**; **Hale and Dorr LLP**; **PricewaterhouseCoopers LLP**; **State of Maryland**, *Maryland Department of Business and Economic Development, Maryland Technology Development Corporation*; and the *University of Maryland, College Park.*

This study analyzes the evolution of the Communications, Content, and Computers/Systems Integration industries (the "InfoComm Cluster") over the past two years and associated trends.

The second in a series, this study evaluates the importance of the InfoComm Cluster and highlights emerging growth factors in the National Capital Area.

The goals of the New Economy Study are to:

● provide a quantitive and qualitive snapshot of the InfoComm Cluster industries and their importance to the region;

● identify other emerging segments within the InfoComm Cluster; and

● suggest, through an overview, where the InfoComm Cluster is heading as it matures.

This study updates data provided in the initial 1998 study and provides new and additional qualitative information that:

● identifies recent major trends and their effect on the region;

● identifies the factors that will drive future InfoComm growth in the region;

● recommends ways in which the region can capitalize on its existing strength to enhance the position of the region in the InfoComm industries; and

● identifies the obstacles that will need to be overcome to ensure future growth.

Vision - Background

Vision - Background

Vision - The InfoComm Cluster

The InfoComm Cluster has continued to drive economic development in the National Capital Area.

■ As high technology industries have expanded globally, the InfoComm Cluster of industries described in the 1998 study have continued to be the key to the region's growth.

■ The different components of the InfoComm Cluster have many complementary and often interdependent products and services.

  ● The InfoComm value cycle starts with **Content** creation and packaging; this includes the new Bioinformatics sector, which is centered in this region.

  ● Different media provide the **Communications** channels for bringing this content to the end users, and new value-added services are customized for end-user needs affecting the system requirements for content delivery.

  ● **Computers and Systems Integration** is the hub of the InfoComm value cycle. It enables content creation and communications throughout the value chain, including expanded distribution through the Internet, and provides value-added services.

■ The interrelationships of these sectors can be viewed as a value cycle, in which there is a continuum of change among communications technologies, value-added service capabilities, end-user demand, and content requirements. All of these ride on the ever-increasing capabilities of computers and systems integration, and are connected among themselves and beyond by the pervasive reach of the Internet.

■ The major strength of the National Capital Area is the region's depth and breadth of activities in all of these sectors.

The InfoComm Cluster consists of Core (Communications and Content) and Enabling (Computers/Systems Integration) industries. Internet services companies span the InfoComm Cluster and merge elements from both Core and Enabling industries.

Core Industries		Enabling Industries
COMMUNICATIONS	**CONTENT**	**COMPUTERS & SYSTEMS INTEGRATION**
■ Organizations that provide **communications services** and **access** through combinations of point-to-point circuits, interface arrangements, and routing switching, as well as marketing, provisioning, and care. ■ Organizations that manufacture and develop communications equipment.	■ Organizations that **create, package or distribute** content for commercial purposes in any format. ■ Providers of non-commercial content, such as the Federal Government, have not been included in the quantification of the size of this industry.	■ Organizations that produce **software** and provide **programming** services (outside of integration services). ■ Organizations that develop, implement or maintain software applications. ■ Organizations that provide **integrated services** for specified applications. ■ Organizations that **manufacture** and develop computer **equipment.** ■ This definition does not include pure **resellers** of equipment.
■ Wireline ■ Wireless ■ Satellite ■ Cable ■ ISPs (Internet Service Providers) ■ Equipment	■ Traditional Content/Media (print media and broadcast media) ■ New Content (new media, digital media, and Internet-related content) ■ Biotechnology/ Bioinformatics (biological and genomic data and its management)	■ Software Applications & Development ■ Systems Integration & Consulting ■ Computer Services & Other ■ Hardware
Internet Related Services "e-commerce"		

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The New Economy in the National Capital Area has depth and breadth in all elements of the InfoComm value cycle.

Major Internet Related Services: Major Internet backbone and service providers, such as Network Solutions, are located in the region because of the presence of major Internet switching capabilities and a critical mass of people with relevant skills. These elements exist because this was where the initial development work on the Internet was performed.
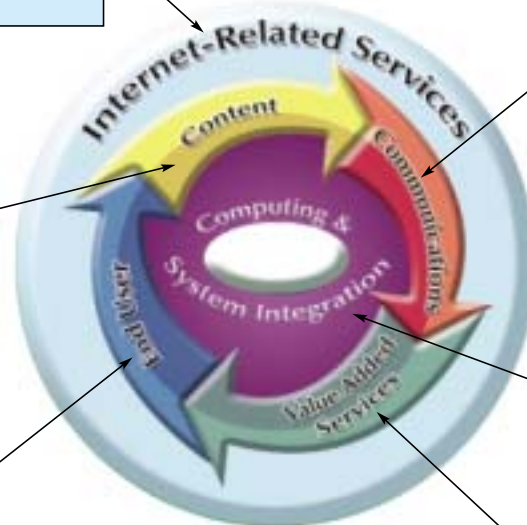
Communications: The range and strength of communications companies are built on the presence of key network facilities. They form a hub for communications carriers of traditional voice as well as emerging wireless and Internet services.

- Concert
- Teleglobe
- UUNet/WorldCom
- Winstar
- Teligent
- XO Communications
- Network Access Solutions
- VIA NET.WORKS
- Cable and Wireless USA
- Aether Systems
- INTELSAT
- Motient
- Loral Cyberstar
- Hughes Spaceway
- Ciena
- Savvis
- PSINet
- TeleCorp PCS
- Orbital Sciences
- Talk.com
- XM Satellite Radio

Content: The content creators are major players with great depth. This region has a unique set of Federal Government entities and ancillary media that draw from them, as well as developers of innovative content for print, television, and Internet distribution. Included in this is the emerging Bioinformatics industry.

- Library of Congress
- Smithsonian
- NIH
- Discovery Communications
- National Geographic
- Washington Post
- AOL Time Warner
- Gannett
- Celera Genomics
- C-Span

Computers and Systems Integration: Built on base of large-scale Federal Government contracting, the strong computer and systems integration sector is a major reason the area has become one of the top 5 high-tech regions in the country. The evolution of the Internet from this base and the expanded networking capabilities it has engendered provide a multi-layered framework for business growth.

- OPNET
- AMS
- Enterworks
- USinternetworking
- webMethods
- Dyncorp
- Litton PRC
- OTG
- Landmark Systems
- MainControl

End-Users: The broad base of companies within the InfoComm Cluster and other technology sectors are prime users of each other's services. This base is bolstered by the Federal Government - one of the world's largest users of computer and communications systems, software, and services.

Value-Added Services: The National Capital Area has been a center for key innovative industry sub-sectors, including Internet content distribution, caching, and delivery.

Internet-Related Services

Content

Communications

Computing & System Integration

End-User

Value-Added Services

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The National Capital Area encompasses the counties of Northern Virginia and Suburban Maryland as well as Washington D.C.

Virginia Counties

1. Loudoun
2. Fairfax
3. Prince William
4. Arlington
5. Fauquier
6. Stafford
7. Spotsylvania

Cities of:

Alexandria
Fairfax
Falls Church
Fredericksburg
Manassas

Washington D.C.

Maryland Counties

1. Howard
2. Prince George's
3. Montgomery
4. Ann Arundel
5. Frederick
6. Baltimore
7. Charles
8. Calvert

Baltimore City

Vision - Geography
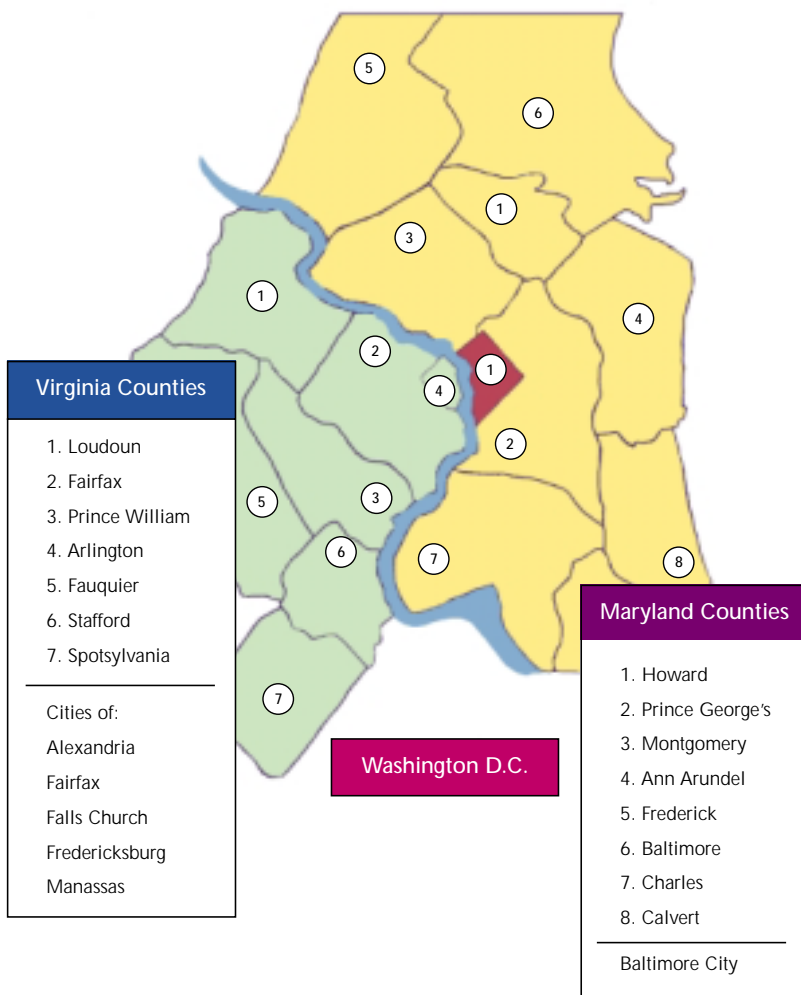
The InfoComm Cluster has emerged as the second largest employer in the National Capital Area, with total employment of 550,000 - 60% more than that of the Federal Government.

This represents significant growth since the initial study. At that time InfoComm employment was just slightly above that of the Federal Government. Since 1998, Federal Government employment remained stable.

NATIONAL CAPITAL AREA EMPLOYMENT BY INDUSTRY — SEPTEMBER 1999

Industry	Employment (Thousands)
Business & Personal Services	1647
InfoComm Cluster	552
Retail Trade	440
State & Local Government	434
Federal Government	345
Finance, Insurance, & Real Estate	255
Manufacturing	227
Transportation & Public Utilities	206
Construction	159
Wholesale Trade	103

Employment (Thousands)

Source: Bureau of Labor Statistics, PwC Database

Implementing the Vision - Overview
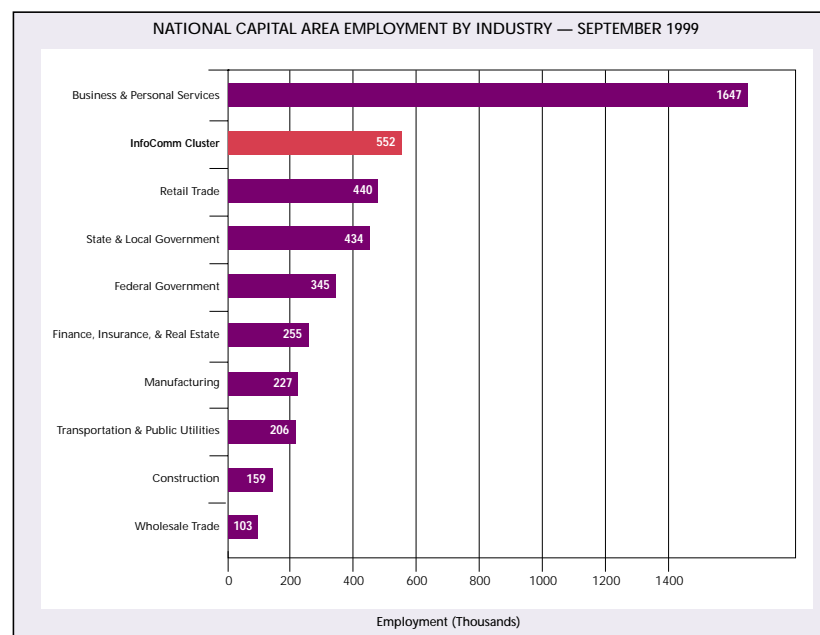
In relation to total employment, the National Capital Area's InfoComm Cluster employment far exceeds the average nationally.

**Total Employment -
Small Percentage of National**

Regional
3.1 million
(2%)

Rest of US
129.8 million

Source: Bureau of Labor Statistics

**Total InfoComm Employment -
Significant Percentage of National**

Regional
552,286
(11%)

Rest of US
4.7 million
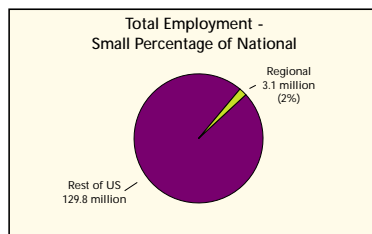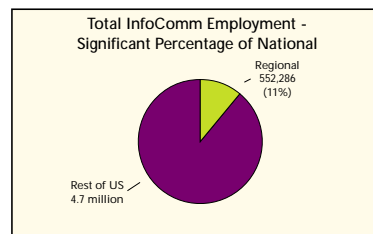
Source: Bureau of Labor Statistics

The National Capital Area has a broad diversity of employment and sales in all InfoComm sectors.

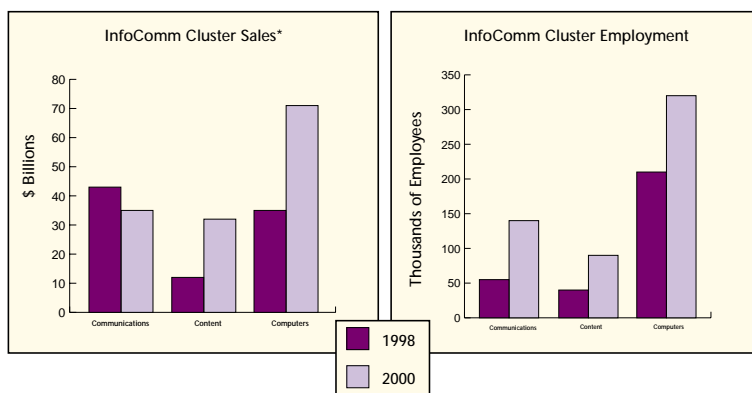*When compared with the initial study, the Computers/Systems Integration sector now plays a greater role within the InfoComm Cluster, generating twice the sales, and more than twice the number of employees of the other two sectors (Communications and Content).*

InfoComm Cluster Sales*

$ Billions

	Communications	Content	Computers

InfoComm Cluster Employment

Thousands of Employees

	Communications	Content	Computers

■ 1998
■ 2000

* Regional sales have been calculated on establishments 'headquartered' in the National Capital Area.

Comments from InfoComm CEOs in roundtable sessions and individual interviews conducted for the New Economy Study revealed that a strong combination of factors led them to locate their businesses in the National Capital Area.

PERCENT MENTIONING

PERSONAL CONNECTIONS

Many CEOs started out working for the government or other companies in the region and have their roots and networks here.

25%

ACCESS TO CUSTOMERS AND RELATED BUSINESSES

The inter-relationships of InfoComm industries lead communications, content, and computer companies to want to be in close proximity to each other.

25%

ACCESS TO HIGH-QUALITY LABOR FORCE

The National Capital Area has established a critical mass of well-educated and highly skilled people with experience in key industry sectors.

25%

ATTRACTIVE COSTS OF DOING BUSINESS

Those who evaluated this region against other high-tech areas such as Silicon Valley/New York/Boston noted the lower costs of operations in the National Capital Area – especially lower costs for office space and staff, and lower turnover rates.

16%

OVERALL QUALITY OF LIFE

Desirable qualities of this region include access to affordable housing, recreational and educational opportunities, and employment opportunities for spouses.

16%

ACCESS TO FEDERAL GOVERNMENT

Proximity to the Federal Government is considered extremely important for those building on government content or selling to the government.

12%

*These factors combine to provide a unique environment for growth.*

The perception by CEOs that the National Capital Area is a good place to locate a business is supported by the facts.

■ The cost of living is lower than all of the other big InfoComm Cluster centers

COST OF LIVING COMPARISON	
City	Index
New York	251.9
Los Angeles	148.1
Boston	131.3
Washington D.C.	115.7
Austin	105.7
Atlanta	104.1
National Average	100.0
Baltimore	95.9
San Francisco - San Jose	Not Measured

Source: ACCRA Cost of Living Index, Second Quarter 2000
(published October 2000 by ACCRA)

■ The National Capital Area has office space available and at reasonable rates in comparison to other centers
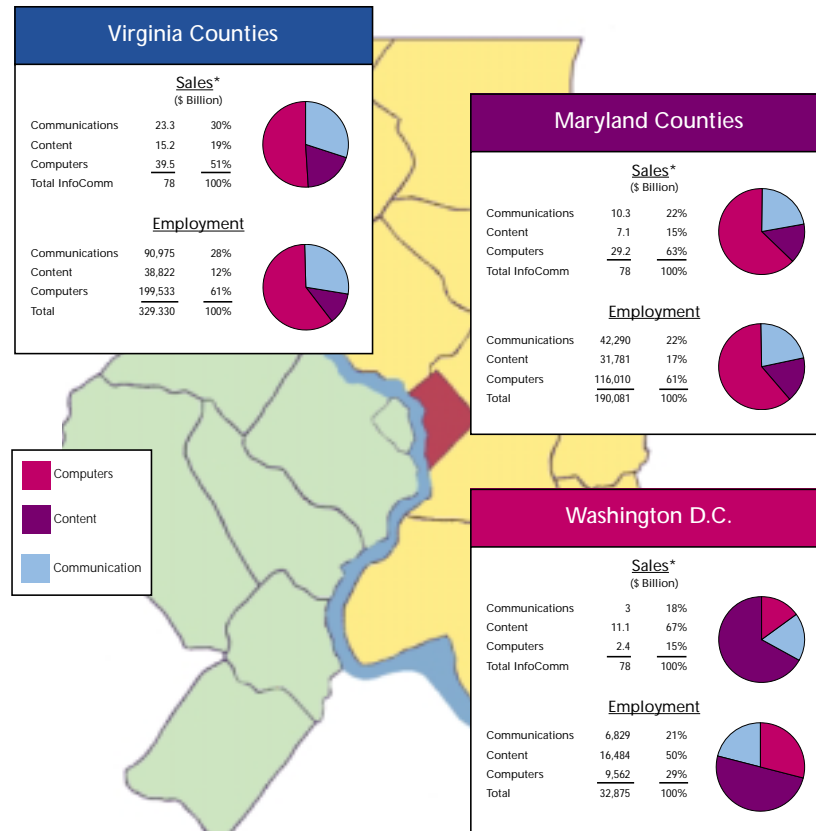
OFFICE VACANCY RATES FOR
GREATER WASHINGTON AREA IN 2000*
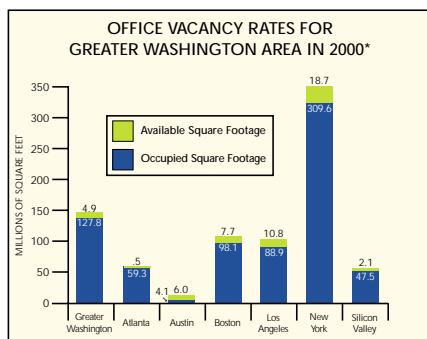
Source: Greater Washington Initiative

* Greater Washington Area as defined by the Greater Washington Initiative does not include Baltimore

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Within the InfoComm Cluster, the combination of the three jurisdictions shows strong performance in all three sectors. The Computers sector dominates in both Virginia and Maryland, while the Content sector is strongest in the District of Columbia.

Virginia Counties

Sales*
($ Billion)

Communications	23.3	30%
Content	15.2	19%
Computers	39.5	51%
Total InfoComm	78	100%

Employment

Communications	90,975	28%
Content	38,822	12%
Computers	199,533	61%
Total	329,330	100%

Maryland Counties

Sales*
($ Billion)

Communications	10.3	22%
Content	7.1	15%
Computers	29.2	63%
Total InfoComm	78	100%

Employment

Communications	42,290	22%
Content	31,781	17%
Computers	116,010	61%
Total	190,081	100%

Washington D.C.

Sales*
($ Billion)

Communications	3	18%
Content	11.1	67%
Computers	2.4	15%
Total InfoComm	78	100%

Employment

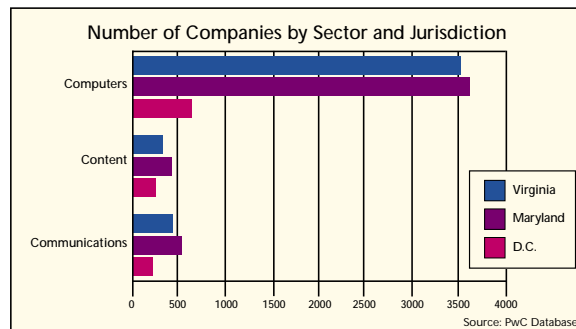|		
Communications	6,829	21%
Content	16,484	50%
Computers	9,562	29%
Total	32,875	100%

Legend:
- Computers
- Content
- Communication

* Regional sales have been calculated on establishments 'headquartered' in the National Capital Area.

The InfoComm Cluster has grown in importance to the National Capital Area and has matured.
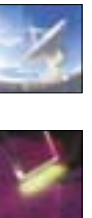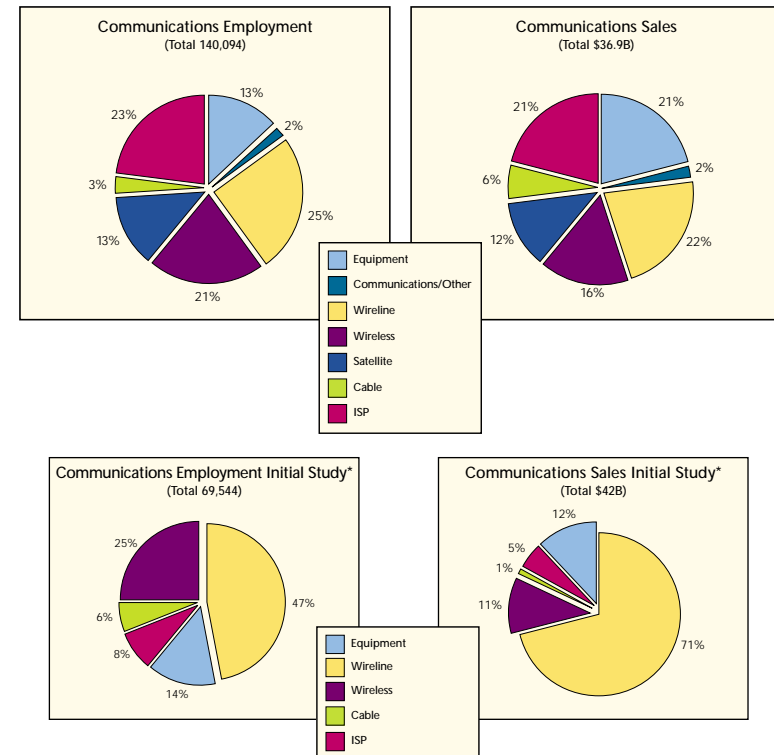
- The InfoComm Cluster now employs some 60% more people than does the Federal Government and is second only to the business and personal services sector.

- The InfoComm Cluster supports some 550,000 employees in the National Capital Area.

- The Computers sector provides almost 60% of these jobs.

- The InfoComm Cluster generates $140 billion in sales by companies based in the region.

- Half of the sales are in the Computer sector.

- Venture capital investment in the first six months of 2000 topped $2 billion. This exceeded the total funding for all of 1999 and represents more than a five-fold increase over the 1997 total of $390 million.

Throughout the region, this maturity has led to greater entrepreneurial success and the emergence of new companies at a rapid rate. The 9,800 businesses in the InfoComm Cluster are, in fact, well distributed around the National Capital Area, with all jurisdictions well represented in all sectors.

Number of Companies by Sector and Jurisdiction

Computers

Content

Communications

0 500 1000 1500 2000 2500 3000 3500 4000

Virginia
Maryland
D.C.

Source: PwC Database

Communications: 140,094 people are employed in Communications companies in the region, generating $36.9 billion in sales.

This sector has diversified broadly since the initial study.* There has been especially strong growth in the ISP market, as well as the wireless and satellite industries which were broken out separately in this study. The evolution of optical networking has led the growth of the equipment sub-sector in the National Capital Area.

Communications Employment
(Total 140,094)

13%
2%
25%
21%
13%
3%
23%

Equipment
Communications/Other
Wireline
Wireless
Satellite
Cable
ISP

Communications Sales
(Total $36.9B)

21%
2%
22%
16%
12%
6%
21%

Communications Employment Initial Study*
(Total 69,544)

47%
14%
8%
6%
25%

Equipment
Wireline
Wireless
Cable
ISP

Communications Sales Initial Study*
(Total $42B)

12%
5%
1%
11%
71%

* At the time of the initial study, MCI was headquartered in Washington D.C. and its sales accounted for a significant percentage of the communications sector.

Patterns of Growth

Patterns of Growth - Communications

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Overall, the Communications sector is represented by a broad array of leading companies.

■ Two years ago, the Communications sector in the region was dominated by traditional telephony, in particular Bell Atlantic and MCI. As these companies have undergone mergers and their headquarters have changed, a wide range of vibrant new carriers have been created or have relocated here to wireline and wireless markets:

THE RANGE OF LEADING COMPANIES THROUGHOUT THE COMMUNICATIONS SECTOR IS UNIQUELY BROAD INCLUDING ILECS, CLECS, LONG-DISTANCE AND INTERNATIONAL CARRIERS, AND FIXED AND MOBILE WIRELESS PROVIDERS		
– Aether Systems	– Motient	– Teleglobe
– Cable & Wireless USA	– Network Access Solutions	– Teligent
– Ciena	– Nextel	– UUNet/Worldcom
– Concert	– Primus Telecommunications	– VIA NET.WORKS
– INTELSAT	– PSINet	– Winstar
– Loral Cyberstar	– Savvis	– XO Communications
– Hughes	– Telecorp PCS	

■ Equally dramatic has been the continued and growing role of the National Capital Area as the hub of global Internet services.

● The Internet Service Provider (ISP) market is dominated by **America Online** (now AOL Time Warner), an Ashburn, VA company which had over 27 million subscribers worldwide as of January 30, 2001. CompuServe Inc., which was acquired by AOL, was responsible for adding 2.8 million of the corporation's subscriber base. There are 80 million registered users of ICQ and over 30 million Netscape.com users. (Source: AOL)

● Three of the top ten U.S. Internet backbone providers are local companies.

– **UUNET** (**WorldCom**); **Cable & Wireless USA; Concert**

● The National Capital Area ranks first nationwide in Internet penetration.

– 59.9% of adults in the National Capital Area are Internet users compared to 56.1% in the San Francisco Bay Area.

— Business 2.0, January 2000.

■ Two key communications trends driven by the demand for high-speed, broadband/Internet access have developed strongly in this region:
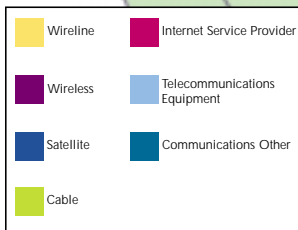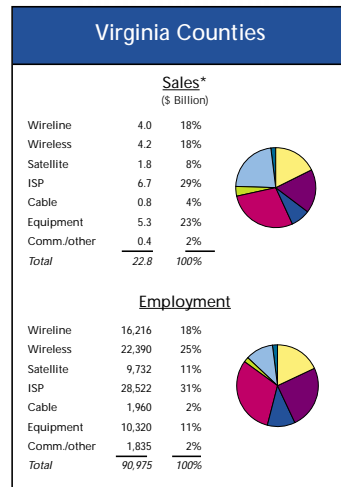
● Optical Networking - Described in the September 18, 2000 Fortune Magazine as "the hottest area of technology these days".

● Linthicum, MD based **Ciena** is a leader in this market, manufacturing telecommunications equipment that increases the speed and efficiency of fiber-optic networks - notably dense wave length division multiplexing (DWDM), as well as intelligent switching and distribution technologies. Ciena is a solid success story on Wall Street in a difficult year for communications companies.

● One of Ciena's founders has produced a second-generation business, with the creation in Columbia, MD of optical networking manufacturer **Corvis**.

● Wireless Data - a rapid growth sector in the US and overseas, providing Internet access and other high-speed/broadband services for fixed and mobile users.

● Three of the six companies leading the fixed wireless data market are based in the National Capital Area: **Teligent**, **Winstar**, and **XO Communications**.

● **Aether Systems**, **Nextel** and **Motient** are aggressive players in the mobile data sector; Forrester Research projects mobile Internet to be a $3.8 billion business by 2005

■ The National Capital Area was also the breeding ground for the satellite industry and continues to be the center of new developments in this area.

● **INTELSAT**, **Loral Cyberstar**, **Hughes**, **Lockheed Martin**, **Astrolink**, and **Orbital Sciences** are among the best known names in satellite communications, and all are based in this region.

– There is a set of businesses emerging in the National Capital Area to take advantage of new satellite technologies, including the need for broadband Internet access, the convergence of Internet and video, remote sensing, and digital and audio broadcasting. These new businesses include:

● Residential broadband satellite services - **StarBand** and **DirecPC**

● Satellite radio services - **WorldSpace** and **XM Satellite Radio**

● Remote satellite imaging - **OrbImage**

● Satellite Internet caching and other Internet enabling technologies - **SkyOnline, Cidera, iDirect and OrbLynx**

Patterns of Growth - Communications

Patterns of Growth - Communications

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Patterns of Growth - Communications

Communications: All three jurisdictions have a well-balanced mix of Communications companies. ISPs are the leading employers and sales generators in Virginia, wireline companies dominate in Maryland, and satellite and wireline companies are strong in the District of Columbia.

Virginia Counties

Sales*
($ Billion)

Wireline	4.0	18%
Wireless	4.2	18%
Satellite	1.8	8%
ISP	6.7	29%
Cable	0.8	4%
Equipment	5.3	23%
Comm./other	0.4	2%
Total	*22.8*	*100%*

Employment

Wireline	16,216	18%
Wireless	22,390	25%
Satellite	9,732	11%
ISP	28,522	31%
Cable	1,960	2%
Equipment	10,320	11%
Comm./other	1,835	2%
Total	*90,975*	*100%*

Legend:
- Wireline
- Wireless
- Satellite
- Cable
- Internet Service Provider
- Telecommunications Equipment
- Communications Other

Maryland Counties

Sales*
($ Billion)

Wireline	2.8	27%
Wireless	1.4	14%
Satellite	1.5	15%
ISP	0.8	8%
Cable	1.2	8%
Equipment	2.3	23%
Comm./other	0.2	2%
Total	*10.2*	*100%*

Employment

Wireline	14,500	34%
Wireless	5,947	14%
Satellite	7,858	19%
ISP	2,374	6%
Cable	2,427	6%
Equipment	8,526	20%
Comm./other	658	2%
Total	*42,290*	*100%*

Washington D.C.

Sales*
($ Billion)

Wireline	1.1	38%
Wireless	0.1	3%
Satellite	1.2	42%
ISP	0.2	7%
Cable	0.2	7%
Equipment	0.02	1%
Comm./other	0.05	2%
Total	*2.87*	*100%*

Employment

Wireline	3,361	49%
Wireless	423	6%
Satellite	1,122	16%
ISP	1,247	18%
Cable	493	7%
Equipment	36	1%
Comm./other	147	2%
Total	*6,829*	*100%*

- In Virginia, wireless, wireline, and equipment together form a strong second tier of companies.
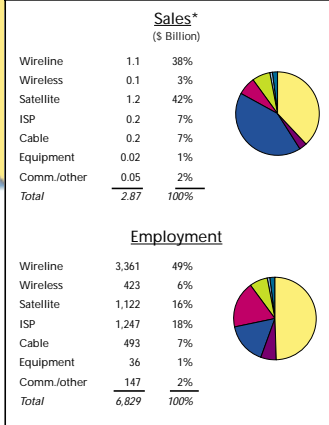- Maryland has three strong second-tier sectors.

* Regional sales have been calculated on establishments 'headquartered' in the National Capital Area.

Patterns of Growth - Content
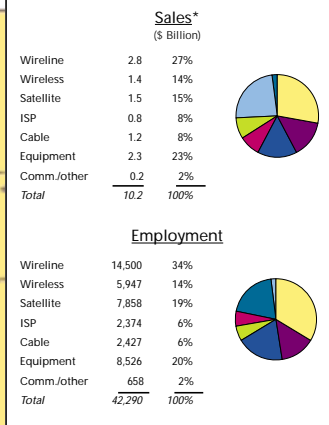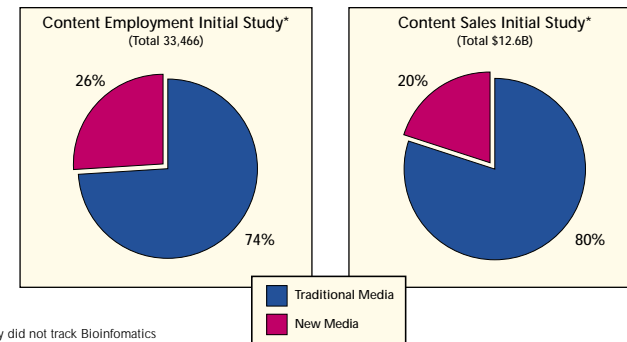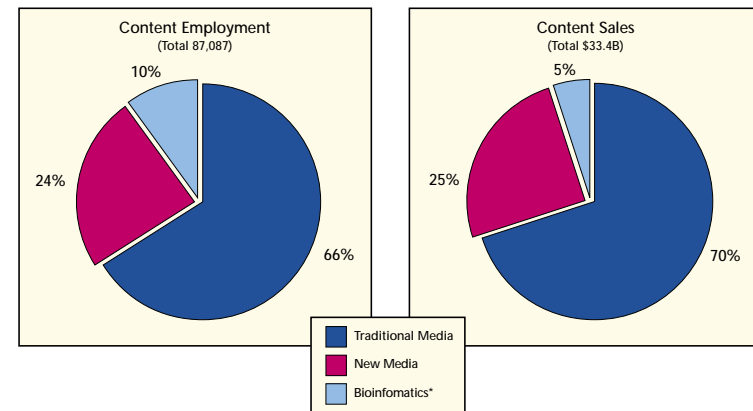
Content: 87,087 people are employed in private sector content companies in the National Capital Area, generating $33.4 billion in sales.

The Content sector has diversified with the emergence of the Bioinformatics sector. In addition, new media businesses, such as Blackboard, Inc. and eMotion, have expanded with the growth of the Internet.

Key to the region's strength is a core of Internet content companies that have developed from the existing media businesses. This foundation in traditional media should enable these companies to survive the "dot-com" shakeout.

Content Employment
(Total 87,087)
- 66%
- 24%
- 10%

Content Sales
(Total $33.4B)
- 70%
- 25%
- 5%

Legend:
- Traditional Media
- New Media
- Bioinfomatics*

Content Employment Initial Study*
(Total 33,466)
- 74%
- 26%

Content Sales Initial Study*
(Total $12.6B)
- 80%
- 20%

Legend:
- Traditional Media
- New Media

* Initial study did not track Bioinfomatics

The National Capital Area is home to several global leaders in content production, including leaders in the move to Internet-focused services.

Discovery Communications	Discovery Communications Inc, of Bethesda, MD distributes a wide range of programming globally via multiple satellite and cable channels and through Discovery.com.
National Geographic Society	The National Geographic Society is the world's largest not-for-profit educational society, with some 9 million members world-wide. National Geographic magazine is read by 45 million people. National Geographic Ventures, a for profit subsidiary, combines the organization's television, maps, and interactive businesses.
The Washington Post Company	In addition to newspaper publishing, The Washington Post Company owns and operates broadcast and cable television stations, publishes *Newsweek* magazine, and provides educational and career development services.
AOL Time Warner	As a leader in the new media sector, AOL has grown from an "Internet company" to become one of the world's largest media conglomerates.

Over the last two years, a new core Content industry has also emerged in the region with the development of Bioinformatics.

■ The recently completed human genome map has been a key success for government and private biotechnology enterprises in the National Capital Area, and has drawn attention to the wealth of resources in the region.

   ● As this sector evolves and financial genomics moves to the forefront, major investors and big pharmaceutical money are expected to fund regional developments.

■ There are now some 627 Bioinformatics companies in the region employing over 36,000 people.

■ Bridging local strengths in medical research and information technology, Bioinformatics provides tools for new advances and improved speed to market by companies such as **Celera**, **Human Genome Sciences**, **MedImmune**, **Celadon Laboratories**, **Capital Genomix**, **Chesapeake PERL**, **Genome Dynamics**, **GenVec**, **Protiveris**, and **Viaken**.

■ **DNA Alley** - *Time Magazine* describes a DNA Alley in Montgomery County, Maryland - the "15 mile stretch of Interstate 270 that runs from Bethesda to Gaithersburg…[now housing] one of the world's largest and smartest collections of genomic firms. The chief draw is the NIH, which dispenses $14 billion a year in research grants. But there are other attractions--proximity to Johns Hopkins, a start-up-friendly local government, an abundance of office space; and most of all, a critical mass of like-minded scientist-entrepreneurs determined to unravel the secrets of the genome and spin them into gold."

The National Capital Area houses a unique set of resources built upon the presence of the Federal Government.

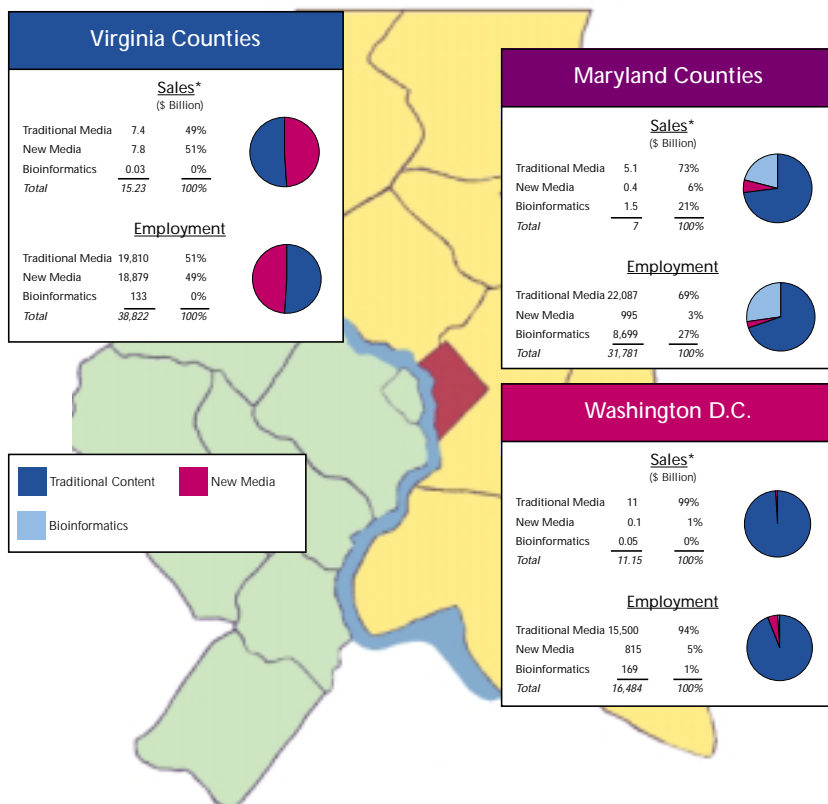|	
Government Printing Office	Founded over 140 years ago, the Government Printing Office offers an online service, GPO Access, which was formed in 1993. In FY1999, the GPO produced 38,289 separate publications. GPO Access supports approximately 20 million retrievals per month with access to over 1,500 Federal databases. ● Over 3,200 employees, most in the National Capital Area
Library of Congress	Founded in 1800, the Library of Congress has a collection of 119 million items, with over 10,000 items added daily. Eighty million requests for information are supported per month on Library of Congress electronic systems and 1 million people visit monthly. ● 4000 employees
Smithsonian Institution	Founded in 1846, the Smithsonian holds more than 140 million artifacts and specimens in 16 museums and galleries. Nine of the museums are located on the National Mall, with five others and the Zoo elsewhere in Washington, D.C. In 1999, the Smithsonian had over 30 million visitors and revenues of $869 million. The Smithsonian website receives over 40 million hits per month. ● 5,100 employees
National Institutes of Health	Founded in 1887, NIH supports 35,000 grants at any time in educational, research, and training institutions through a budget which in 2000 exceeded $17.8 billion. Ninety-seven Nobel Prize winners have been affiliated with NIH. ● 17,700 employees in the National Capital Area

Other Federal Agencies have also provided foundation stones for emerging content.

Department of Energy	Through its biological research program, the Department of Energy provided the funding and impetus for the Human Genome Project and other Bioinformatics programs.

An additional unique aspect of the National Capital Area is the presence of over 3,600 trade and professional associations that produce a significant amount of content and industry specific research.

Patterns of Growth - Content

Content: The new Bioinformatics sector is based in Maryland, while New Media is centered in Northern Virginia.

Virginia Counties

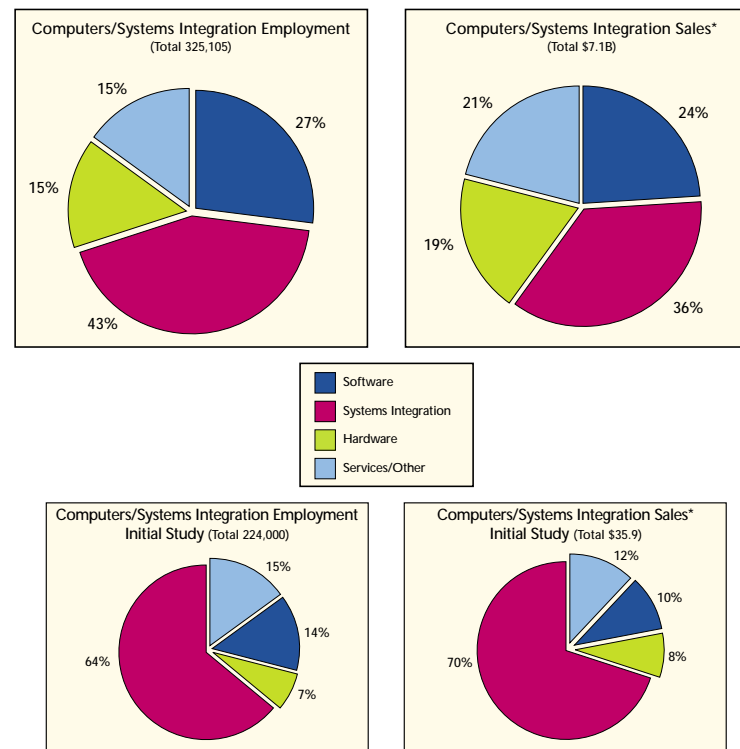**Sales***
($ Billion)

Traditional Media	7.4	49%
New Media	7.8	51%
Bioinformatics	0.03	0%
Total	*15.23*	*100%*

Employment

Traditional Media	19,810	51%
New Media	18,879	49%
Bioinformatics	133	0%
Total	*38,822*	*100%*

Maryland Counties

Sales*
($ Billion)

Traditional Media	5.1	73%
New Media	0.4	6%
Bioinformatics	1.5	21%
Total	*7*	*100%*

Employment

Traditional Media	22,087	69%
New Media	995	3%
Bioinformatics	8,699	27%
Total	*31,781*	*100%*

Washington D.C.

Sales*
($ Billion)

Traditional Media	11	99%
New Media	0.1	1%
Bioinformatics	0.05	0%
Total	*11.15*	*100%*

Employment

Traditional Media	15,500	94%
New Media	815	5%
Bioinformatics	169	1%
Total	*16,484*	*100%*

Legend:
- Traditional Content
- New Media
- Bioinformatics

- In Washington D.C., traditional media employment and sales dominate. While traditional media employment is slightly lower than that in the other two jurisdictions, sales revenues in D.C. are twice those in Maryland and 50% higher than those in Virginia.

- In Virginia, Content sector employment and sales are virtually evenly divided between traditional and new media.

* Regional sales have been calculated on establishments 'headquartered' in the National Capital Area.

Patterns of Growth - Computers/Systems Integration

The Computers and Systems Integration sector has remained well diversified, and has more than doubled in sales and increased employment by approximately 50% since the initial study.
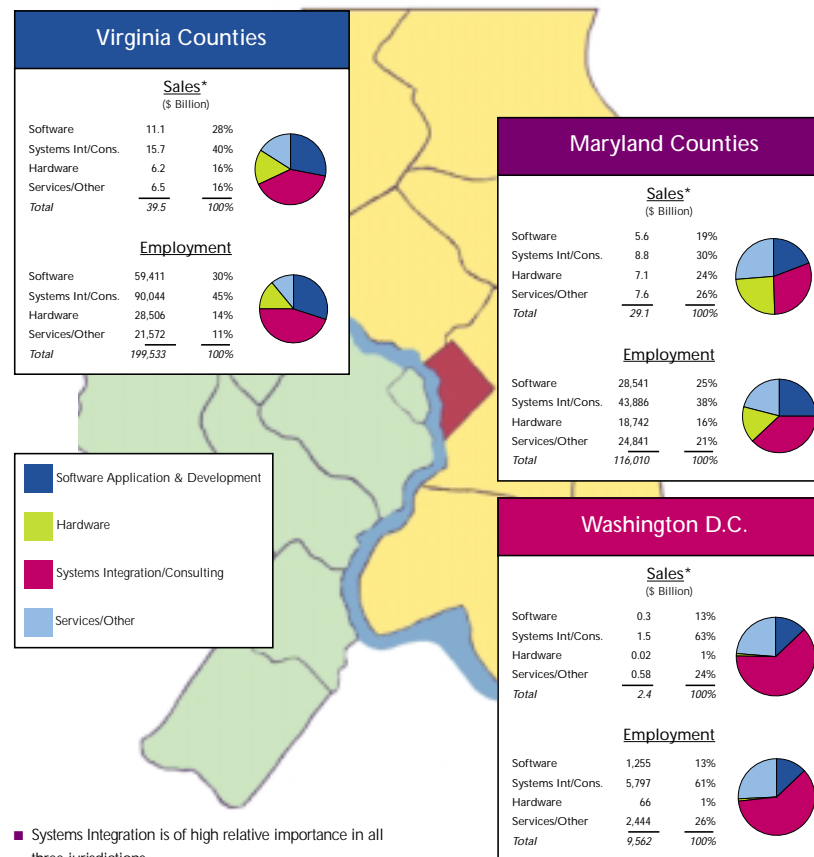
Computers/Systems Integration Employment
(Total 325,105)

- 27%
- 43%
- 15%
- 15%

Computers/Systems Integration Sales*
(Total $7.1B)

- 24%
- 36%
- 19%
- 21%

Legend:
- Software
- Systems Integration
- Hardware
- Services/Other

Computers/Systems Integration Employment Initial Study (Total 224,000)

- 64%
- 15%
- 14%
- 7%

Computers/Systems Integration Sales* Initial Study (Total $35.9)

- 70%
- 12%
- 10%
- 8%

* Regional sales have been calculated on establishments 'headquartered' in the National Capital Area.

Patterns of Growth - Computers/Systems Integration

The Computers and Systems Integration sector - the largest of the InfoComm sectors in the region - employs 325,105 people in the region, producing $71.1 billion in sales.

■ With the Federal Government and the systems requirements it generates as a springboard, the Computer and Systems Integration industries in the National Capital Area have expanded in core and innovative areas, with approximately 7,690 firms now operating in this sector in the region.

■ One side of this business is represented by companies focused on large-scale systems design and implementation, largely for government.

● Examples, each with 1999 revenues in excess of $1.1 billion, are **American Management Systems** and **Litton PRC**.

■ Largely built on the need for expanded Internet capabilities, more focused players include:

● **webMethods**, started in Fairfax, VA, in 1996, to focus on innovative business-to-business integration software, with 1999 revenues of $23 million, and a CEO - Phil Merrick - named as one of *Business Week's* e-business Top 25 Up-and-Comers (May 2000).

● **OTG Software**, founded in Bethesda, MD, in 1992, produces software to manage data access and storage, and had 1999 revenues of $ 25.4 million.

● **OPNET Technologies**, in Washington, D.C., provides technology solutions that enable optimization of the performance of communications networks, and had FY 2000 revenues of $19 million. Revenues for the first six months of FY 2001 up 70% over last year.

● **Savvis**, of Reston, VA, provides Internet access, managed IP solutions, and networking to large businesses and other ISPs. Primarily serving financial institutions, Savvis had 1999 revenues of $18.5 million.

● **Enterworks**, based in Ashburn, VA, develops software for enterprise portals and e-marketplaces. CEO John Wood was instrumental in spinning off the company from Telos. 1999 revenues exceeded $12 million.

● **Landmark Systems**, of Reston, VA, reported $55 million in sales in 1999. The company has become a leader in the performance management software sector. CEO Kathy Clarke is a former chair of the Northern Virginia Technology Council.

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Systems Integration is the biggest employment and sales generator in the Enabling industry segment.

Virginia Counties

Sales*
($ Billion)

Software	11.1	28%
Systems Int/Cons.	15.7	40%
Hardware	6.2	16%
Services/Other	6.5	16%
Total	*39.5*	*100%*

Employment

Software	59,411	30%
Systems Int/Cons.	90,044	45%
Hardware	28,506	14%
Services/Other	21,572	11%
Total	*199,533*	*100%*

Maryland Counties

Sales*
($ Billion)

Software	5.6	19%
Systems Int/Cons.	8.8	30%
Hardware	7.1	24%
Services/Other	7.6	26%
Total	*29.1*	*100%*

Employment

Software	28,541	25%
Systems Int/Cons.	43,886	38%
Hardware	18,742	16%
Services/Other	24,841	21%
Total	*116,010*	*100%*

Washington D.C.

Sales*
($ Billion)

Software	0.3	13%
Systems Int/Cons.	1.5	63%
Hardware	0.02	1%
Services/Other	0.58	24%
Total	*2.4*	*100%*

Employment

Software	1,255	13%
Systems Int/Cons.	5,797	61%
Hardware	66	1%
Services/Other	2,444	26%
Total	*9,562*	*100%*

■ Software Application & Development

■ Hardware

■ Systems Integration/Consulting

■ Services/Other

■ Systems Integration is of high relative importance in all three jurisdictions.

■ Maryland and Virginia counties have fairly evenly divided second tier focus in all the other sectors.

* Regional sales have been calculated on establishments with headquarters in the National Capital Area.

Patterns of Growth - Computers/Systems Integration

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Growth of the InfoComm Cluster in the National Capital Area is due in part to its entrepreneurial nature. A key indicator of this entrepreneurial spirit is the number of fast growth "gazelle companies" (those with average annual compound growth rates of 20% or more for four consecutive years).

NUMBER OF PUBLICLY TRADED "GAZELLE" COMPANIES NATIONAL CAPITAL AREA, 1992-1999
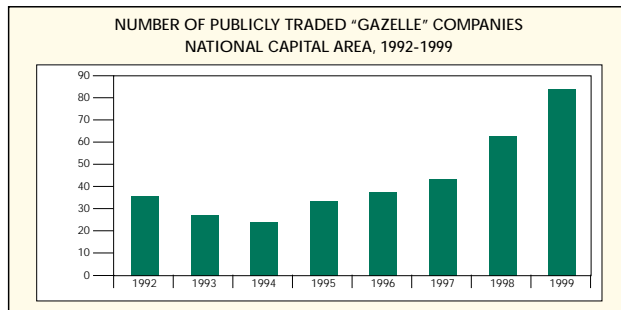
Source: The Potomac Index 2000

The strong entrepreneurial environment is further demonstrated by the fact that companies in the core sector of the InfoComm Cluster are predominately small, with approximately 54% having fewer than 10 employees.

COMMUNICATIONS AND CONTENT COMPANIES IN THE NATIONAL CAPITAL AREA BY NUMBER OF EMPLOYEES
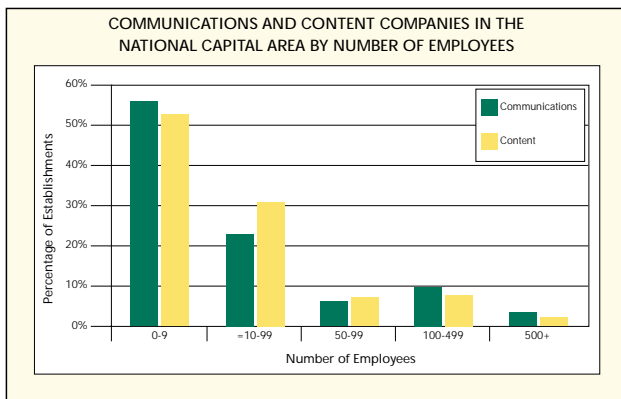
Source: Bureau of Census, Bureau of Labor Statistics, PwCDatabase

■ The Communications industry has a slightly larger proportion of small companies than the Content industry (55% vs. 52%)

■ Despite the presence of significant media companies such as The Washington Post and Gannett, only 2% of all National Capital Area Content companies employ more than 500 people.

Over 60% of the companies in the Computers/Systems Integration industry in the National Capital Area have fewer than 50 employees.

SOFTWARE APPLICATION & DEVELOPMENT

SYSTEMS INTEGRATION

HARDWARE

SERVICES/OTHER
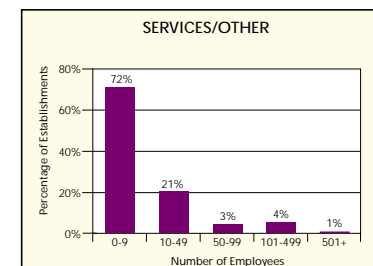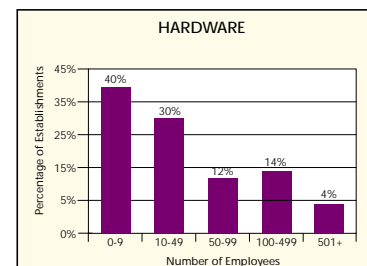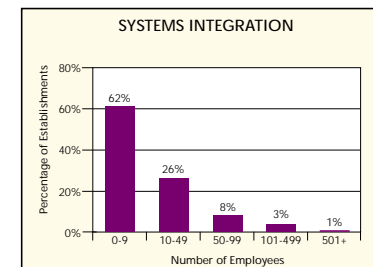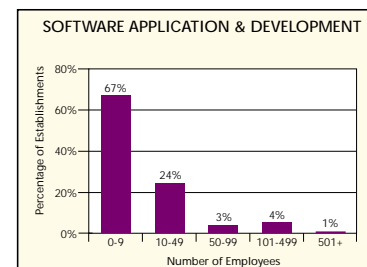
Source: Bureau of Census, Bureau of Labor Statistics, PwC Database

■ The Systems Integration segment has the largest number of small companies (9 or fewer employees) but Diversied Services has the highest percentage (72%).

■ The Hardware segment has the highest proportion of larger companies (50 employees or more).

Patterns of Growth - Entrepreneurship

Patterns of Growth - Entrepreneurship

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26

The impact of the New Economy influences each jurisdiction within the National Capital Area. Each has its own story of growth and dynamics.

District of Columbia

- The District of Columbia has the advantages and drawbacks of being the seat of the Federal Government. It has the advantages of housing the core of Federal employment and ancillary businesses (law firms, associations, Fannie Mae, World Bank, foreign embassies, etc.) Drawbacks include its image as a "government town."

- It is a vibrant city, with cultural and entertainment opportunities not found in the more suburban areas of Virginia and Maryland.

  As Rob McGovern, CEO of Career Builder, notes, "The young people think D.C. is cool, so it's easy to recruit sharp people."

- Many young tech workers were first attracted to the District because they attended one of its top-ranked universities:

  - Howard University
  - George Washington University
  - Georgetown University
  - Gallaudet University
  - Catholic University
  - American University

- About 2,000 of the estimated 2,500 jobs created last year in the District were in the technology field, with over 1,000 firms operating in the InfoComm Cluster.

- A priority of D.C. Mayor Anthony Williams is to attract New Economy firms. In late 2000 the City Council passed a series of incentives to bring high technology companies into the District. They include:

  - Tax credits for workers relocating within or into the District and for businesses to train disadvantaged workers
  - Reductions in the corporate franchise tax
  - Exemptions from key capital gains taxes

- The importance of enhancing the core D.C. role in the New Economy was stated starkly, "For this region to be successful, the District needs to be successful."
  — noted by Mark Ein, Founder of the Venturehouse Group.

- The first D.C.-centric angel investment club seeking to fund start-up companies based in the District of Columbia began meeting in mid-2000. Each member of the Washington Dinner Club—about 75 wealthy individuals—was asked to contribute $150,000, creating an $11 million pool of capital.

Maryland

- Maryland has a broad suburban flavor with an urban focus in Baltimore City.

- Gaining the most attention recently has been the explosion of the biotechnology sector which grew largely out of the National Institutes of Health in surburban Bethesda and Johns Hopkins University in Baltimore.

- This sector now includes 300 biotechnology firms in Maryland, with the core of the biotechnology business in Montgomery County, where two-thirds of the biotechnology firms are located.

- Surburban Maryland is also home to over 3,500 businesses in the computer/systems integration sector.

Computing SubSectors	Companies
Software	979
Systems integration	1,522
Hardware	179
Diversified services	915

- Montgomery County is the richest county in the state, with a median household income of $77,774 (ninth nationally).

- Montgomery County ranks sixth in the nation as having households with incomes of $500,000 or more.

- The University of Maryland, with its flagship institution in College Park and other campuses of the University System of Maryland throughout the state, has over 5,000 undergraduate and 1,000 graduate students majoring in computer sciences and over 1,500 undergraduate and 3,300 graduate students in electrical engineering - both key sources of new employees for the InfoComm sector.

- The recently established Maryland Technology Development Corporation (TEDCO) provides incubator and other facilities in support of the growth of the key InfoComm cluster industries - communications, computer sciences, and biotechnology.

- The Maryland Department of Business and Economic Development supports through the attraction, retention and expansion of the InfoComm Cluster and industry in general with targetted programs and services. Several recent acquisitions have increased Maryland's presence within this Cluster, including Bookham Technologies and Trellis Protonics.
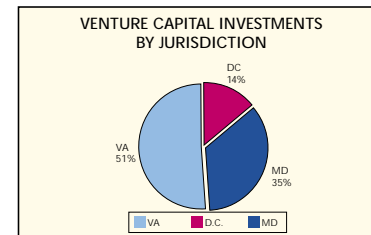
Virginia

- Northern Virginia is best known through the National Capital Area for InfoComm growth.

- In Northern Virginia, there are 2,600 firms with 237,000 employees singularly devoted to technology. The Northern Virginia Technology Council expects these numbers to double by 2010.

- In mid-2000, there were 23,000 job openings in Northern Virginia.

- Suburban Fairfax County recently became the richest county in America, with a median household income of $90,937.

- An estimated 2,000 high-tech firms are located in Fairfax County alone, helping to attract 20,000 new residents each year.

- Arlington County saw 2,992 new jobs in 1999. In nearby Alexandria, 2,082 jobs have been created.

- The reasons behind large scale growth are many, and include the location of a key Internet switching center, the establishment of operations around that center for Internet and communications carriers such as AOL, PSINet, WorldCom and Sprint, and an aggressive campaign by state and local governments to attract InfoComm companies to the area.

- Northern Virginia is home to George Mason University and Marymount University. In addition, the area hosts satellite campuses for the University of Virginia, Virginia Polytechnic Institute, and Old Dominion University.

- The Morino Institute, located in Reston, plays a unique role in supporting entrepreneurship and philanthropy in the Internet and "New Economy" community.

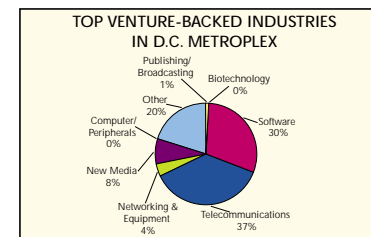*Regional Highlights - Virginia*

Venture Capital in the National Capital Area has evolved into a local service business. InfoComm businesses in the area are no longer as reliant on New York or Silicon Valley venture capital firms.

In the first nine months of 2000, venture capital investments in D.C. Metroplex* Area topped $3 billion. That exceeds total funding for all of 1999 by over $1 billion. While over half of investments are reported in Virginia, Maryland and the District of Columbia have slightly increased their share of venture dollars. In the initial Study which measured the first quarter of 1998, 56% of all investments were made in Virginia. That figure has dropped to 51%.
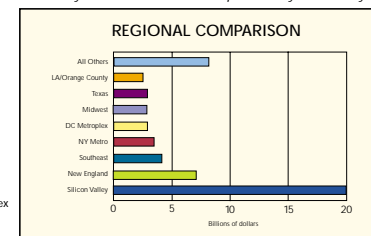
The Telecommunications Industry has consistently received the largest percentage of investments - quarter by quarter - of any industry in D.C. Metroplex. For the first nine months of 2000, 34% of all regional investments were made in telecommunications companies. During that time, D.C. had the second highest level of telecom investments as a percentage of total investments among the 18 regions in the PricewaterhouseCoopers Money Tree Survey.

VENTURE CAPITAL INVESTMENTS BY JURISDICTION

DC 14%
MD 35%
VA 51%

☐ VA   ■ D.C.   ■ MD

Source: PricewaterhouseCoopers Money Tree Survey™

TELECOMMUNICATIONS INVESTMENTS

$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0

$53,532

$1,018 $10,839 $2,967

Telecommunications   Total

■ D.C.   ■ U.S.

Source: PricewaterhouseCoopers Money Tree Survey™

The Telecommunications and Software Industries clearly comprise the majority of investments in D.C. Metroplex.

The Internet strongly influences investment patterns in D.C. Metroplex Area. Nearly 70% of all venture dollars in the first nine months of 2000 were funneled into Internet-related companies. Infrastructure business received the largest percentage of investments during that time with 30% of the total.

TOP VENTURE-BACKED INDUSTRIES IN D.C. METROPLEX

Publishing/Broadcasting 1%
Biotechnology 0%
Other 20%
Computer/Peripherals 0%
Software 30%
New Media 8%
Networking & Equipment 4%
Telecommunications 37%

Source: PricewaterhouseCoopers Money Tree Survey™

THE INTERNET AND VENTURE CAPITAL

Tools/Applications 19%
Access/Infrastructure 34%
Services 24%
Content 7%
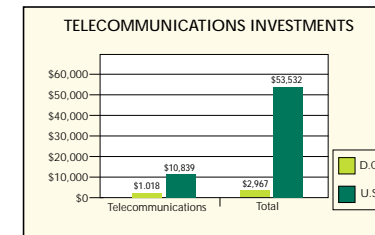E-Commerce: BtoC 6%
E-Commerce: BtoB 10%

Source: PricewaterhouseCoopers Money Tree Survey™

For the first six months of 2000, D.C. Metroplex ranked 5th in venture capital investments among the eighteen regions tracked by the PricewaterhouseCoopers Money Tree Survey.
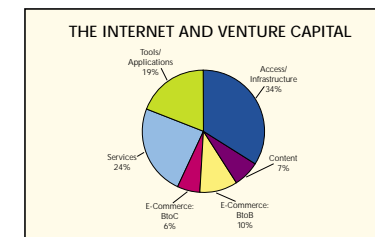
REGIONAL COMPARISON

All Others
LA/Orange County
Texas
Midwest
DC Metroplex
NY Metro
Southeast
New England
Silicon Valley

0   5   10   15   20
Billions of dollars

* In the Money Tree Survey. D.C. Metroplex encompasses the District of Columbia, Maryland, Virginia, and West Virginia.

Supporting the Growth - VC Investment

The dynamic nature of the InfoComm Cluster is evidenced by over 30 IPOs for local companies in 1999/2000. The amount raised by IPOs in the National Capital Area in 2000 represented 9% of all IPO funds nationwide.

National Capital Area IPOs - 1999/2000

Company	State	Offering Amt. ($M)	Industry
Advanced Switching Communications	VA	93.7	Broadband service
Aether Systems	MD	96.0	Wireless services
AppNet Systems	MD	72.0	Computing Solutions
CAIS Internet	D.C.	114	Internet Service Provider (ISP)
CareerBuilder	VA	58.5	Online recruitment
Corvis Corporation	MD	1138.6	Fiber-optic networks
Cysive	VA	57.0	Software engineering
Digex	MD	195.5	Internet hosting
GenVec	MD	38.0	Biotechnology (gen-based products)
Health Extras	MD	60.5	Online health care
InforMax Data Systems	MD	80.0	Bioinformatic software
LifeMinders	VA	58.8	Online direct marketing
Musicmaker.com	VA	122.6	Online music retailer
Net2000 Communications	VA	200.0	Communications services
Network Access Solutions	VA	90.0	DSL services
Online Resources Corp.	VA	43.4	E-Commerce
OPNET Technologies	D.C.	52.0	Software
OTG Software	MD	95.0	Software
PEC Solutions	VA	31.5	Internet-based government solutions
Proxicom	VA	67.3	Applications development
Radio One	MD	171.6	Radio stations
SAVVIS Communications	VA	469.2	Networking services/ISP
Sequoia Software	MD	33.6	Software
TeleCommunication Systems	MD	79.9	Networking applications for wireless
TeleCorp PCS	VA	184.0	Wireless services
USinternetworking	MD	126.0	Application Service Provider (ASP)
Value America	VA	145.5	Online retail
Varsity Group	D.C.	46.9	Online textbook retailer
Vastera	VA	84.0	Software
VIA NET.WORKS	VA	357.0	International ISP
webMethods	VA	165.0	E-Commerce software
XM Satellite Radio	D.C.	102.4	Digital radio programming

Supporting the Growth - IPOs

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Further support to growing InfoComm companies is provided by a dynamic incubator environment that is active in all InfoComm sectors.

National Capital Area Incubators

Company	Year Founded	Ownership	City
Agnition www.agnition.com	2000	Private	Bethesda, MD
DreamLabs www.dream-labs.com	2000	Private	McLean, VA
D.C.VentureNet www.dcventurenet.com	2000	Private	Washington, D.C.
E-incubator www.eincubator.net	2000	Private/Government	Falls Church, VA
Edge Technologies Enterprise Center www.edge-technologies.com	1993	Private	Fairfax, VA
eHIVE, Inc. www.ehive.net	1999	Private	Middleburg, VA
The Emerging Technology Center, Baltimore www.etcbaltimore.com	1999	Government Baltimore City	Baltimore, MD
Georgetown Knowledge Lab www.georgetown.edu/	2000	University	Washington, D.C.
George Mason University Enterprise Center policy2.gmu.edu/mec/index.htm	1999	University	Fairfax, VA
The Greater Reston Chamber of Commerce Incubator Program www.restonchamber.org	1999	Government Reston County	Reston, VA
Highgate Incubator www.highgateintl.com	2000	Private	Washington, D.C.
Howard County NeoTech Incubator www.hceda.org	2000	Government Howard County	Columbia, MD
Human Vision Incubator www.humanvision.com	1999	Private	Landover, MD
2000 Incubator- Greater Reston Chamber of Commerce www.restonchamber.org	1999	Government	Reston, VA
Incube8 www.Incube8.com	1999	Private	Baltimore, MD
Incubator America www.incubatoramerica.com	1999	Private Affiliated with Arlington County and George Mason University	Arlington, VA
iXol Group, LLC www.ixolgroup.com	2000	Private	Washington, D.C.
Maryland Technology Development Center www.mdhightech.org	1999	Government	Rockville, MD
NP Accelerator	2000	Private	McLean, VA
Phase 1 www.phase1.org	1997	Private	Laurel, MD
Scottish Technology & Research Center www.scottishtechnology.com	1997	Government	Herndon, VA
The Technology Growth Center www.pgmc.org	1997	Private partnership with Government	Hyattsville, MD
UMBC Technology Center www.umbc.edu/business/research	1989	Government/University	Catonsville, MD
University of Maryland-Technology Advancement Program (TAP) www.erc.umd.edu/TAP/	1984	University	College Park, MD
US Technologies www.usxx.com	1986	Private	Washington, D.C.
Vector Development www.vectordev.com	2000	Private	Arlington, VA
Venturehouse Group www.venturehousegroup.com	1999	Private	McLean, VA

Supporting the Growth - Incubators

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Supporting the Growth - Reserach and Development

Federal research and development funding undergirds the distinctive technology base of the region.

- The National Capital Area, contains the largest concentration of Federally funded R&D resources in the country.

- The District of Columbia, Maryland, and Virginia overall received $15.3 billion in Federal R&D funding in 1998 (in its academic research institutions, Federal R&D labs, and private companies).

- The region's Federal R&D funding exceeds that of California, the largest single state recipient, although the region's total population is less than half of California's.

  - On a total basis, among all States, those in the National Capital Area ranked near the top: Maryland #2 ($8.1 billion), Virginia, #3 ($4.5 billion), D.C. #10 ($2.7 billion).

  - On a per-capita basis, the District ranked #1, Maryland #2, and Virginia #4.

- Maryland's total of $6.4 billion in Federal research conducted in Federal laboratories was #1 among all States and more than twice that of its nearest competitor.

- Major Federal research and development facilities in the tri-state region include:

  National Institutes of Health
  NASA's Goddard Space Flight Center
  Naval Research Laboratory and Office of Naval Research
  Naval Surface Warfare Centers at Carderock, Dahlgren, and Indian Head
  Edgewood Chemical & Biological Command
  Commerce Department's National Institute of Standards and Technology
  Walter Reed Army Institute of Research
  Armed Forces Institute of Pathology
  Agriculture Departments Beltsville Agricultural Research Center
  HHS Food and Drug Administration
  National Security Agency (funding is classified and not included in totals)

* These figures represent total funding to the states as a whole, including areas outside the geographic region, covered by this study.

33

The region's academic research institutions receive over $1.2 billion in Federal research and development (R&D), equaling if not exceeding the Boston area and Northern California.
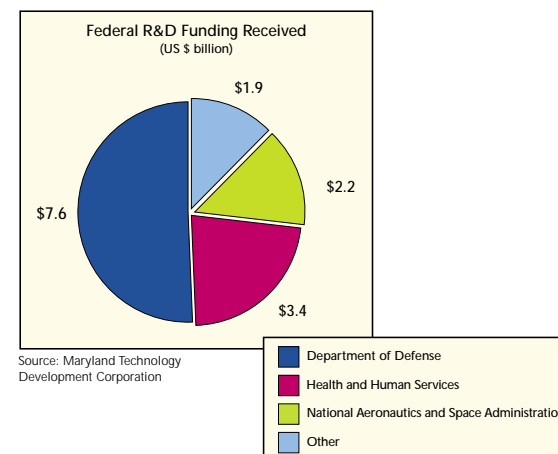
- Johns Hopkins University is the largest academic recipient of Federal R&D funding, nearly $1 billion, including the Applied Physics Laboratory

- Johns Hopkins has been the largest single recipient of NIH funding for nearly two decades, currently $350 million.

Local Academic Research and Development Expenditures

University	Annual Spending	Electrical Engineering	Computer Science
Johns Hopkins	$800 million	$32 million	$ 72 million
University of Maryland	$203 million	$29 million	$ 20 million
George Washington*	$ 27 million	$ 1 million	$ 1 million
George Mason	$ 30 million	$ 3 million	$ 1 million

*GWU does not separate electrical engineering and computer science expenditures.

- Although the region receives funding from most Federal agencies, more than 85% of the funding comes from three major sources:

Federal R&D Funding Received
(US $ billion)

$1.9
$2.2
$7.6
$3.4

Source: Maryland Technology
Development Corporation

- Department of Defense
- Health and Human Services
- National Aeronautics and Space Administration
- Other

Supporting the Growth - Reserach and Development

34

Broad strengths of the National Capital Area economy are viewed by CEOs interviewed for this study as key benefits to their InfoComm businesses and to entrepreneurial activity in general.

In discussing the key advantages of the region for their businesses, CEOs focused on the breadth and depth of the local economy and the resources available to fuel their business growth:

ACCESS TO MULTIPLE SOURCES OF BUSINESS, IDEAS, PEOPLE, AND MONEY:

"Much of the growth in the region is due to the diversity of different technology strains here, the optimism of people in the industry, and their willingness/desire to create new models and attitudes."

— George Vradenburg, Senior VP, AOL

"This area is not limited to only one business industry. Technology companies have now achieved critical mass. People realize that if one thing fails there are other opportunities for success."

— Raul Fernandez, CEO, Proxicom

"True value is created at the intersection of multiple disciplines and we have four disciplines here that intersect: technology, political/governmental, associations/non-profits, and international."

— Reggie Aggarwal, CEO, Cvent.com

"We have the Internet on one side of the river and Biotechnology on the other. The Capital is attractive to outsiders; there is an international flavor."

— John Peeters, Ph.D., Founder and Chairman, Protiveris

HIGHLY SKILLED, WELL-EDUCATED, DIVERSIFIED, AND BALANCED WORKFORCE

"There is a tremendous pool of talent to draw from, with key engineering and computer science programs at Maryland, Virginia Tech, George Washington, and George Mason."

— Art Hurtado, CEO, Invertix

"The last five years have been unreal. The bottom line is that in any career, people hit bumps. For a lot of the entrepreneurs in this region and beyond, this is their second or third career and they understand that these bumps are part of the game."

-Mario Morino
Chairman, Morino Institute
Special Partner, General Atlantic Partners

Other key resources for business growth are found in the region itself - in the infrastructure for doing business and for promoting family quality of life:

INFRASTRUCTURE – TECHNOLOGY AND COMMUNICATIONS NETWORKS:

"Half of all Internet traffic goes through Fairfax County."

— Alex Mandl, CEO, Teligent

"Fiber is the engine of growth."

— Todd Ruelle, CEO, Sonic Telecommunications International

"We needed to locate in a major telecom center with a critical mass of people and technology."

— Alex Mandl, CEO, Teligent

INFRASTRUCTURE - PROXIMITY OF 3 GOOD AIRPORTS:

"Transportation from here to other regions is fabulous. No other city in the country is better."

—Tom Westbrook, Managing Director, Allied Capital

"Being in the middle of the East Coast, with good airport access, makes it easier for us to work globally."

— Interview participant

RANGE OF LIFESTYLE AND RECREATIONAL ALTERNATIVES:

"The culture here is accommodating to families."

—Interview participant

"D.C. is 'Destination City' for young people."

— Stuart A. MacFarland, CEO, Pedestal

"We have a strong arts community, open land/parks, and affordable housing."

— John Backus, Managing Partner, Draper Atlantic

"There is a wide range of alternatives – you're close to New York City, to the mountains, and to the Bay."

— Patrick Nettles, CEO, Ciena

As the InfoComm Cluster matures, the role of the the Federal Government is being recognized most importantly for its value as a base of business opportunity.

- While other areas such as Silicon Valley have long been touted as "the place" to start a new economy company – having a critical mass of high tech workers, a strong academic base, and solid venture capital interest - the National Capital Area has proved to have all of these assets and more.

- The extra value available in the National Capital Area is deep and broad due in part to the base provided by the presence of the Federal Government.

- While almost half of those surveyed see the Federal Government as having little direct impact on their business, the other half cite a wide range of benefits that their businesses and the region as a whole derive from the presence of the Federal City. As the New Economy continues to mature, entrepreneurs are increasingly willing to acknowledge the advantages and strengths this provides.

FEDERAL CONTRACTS - DIRECT AND INDIRECT

"The Feds were our angel investors. They were a great source of contracts to the companies we sell to."

— Mike Pollard, CEO, thinkXML

"If it weren't for the US Government, the infrastructure wouldn't be here."

–Pete Snyder, New Media Strategies

"The US Government is the largest customer in the world, and has the largest R&D operations in the world."

— Reggie Aggarwal, CEO, Cvent.com

FEDERAL GOVERNMENT AS AN ATTRACTOR FOR STAFF:

"Government contracting attracts and produces a trained workforce for technology and telecom companies."

— Mark Ein, Founder, Venturehouse Group

GOVERNMENT REPOSITORY OF CONTENT:

"The U.S. Government is a fertile source of intellectual capital and government grant dollars."

— Roundtable Participant

ACCESS TO DECISION MAKERS AND SERVICE PROVIDERS:

Red Herring Magazine in its "Top Trends 2001" noted the importance of government policy making (domestic and international) as a key trend influencing the structure of Internet and media growth - including the way companies organize and do business. Being close to the decision makers gives businesses in the National Capital Area a steady advantage. This will also be increasingly true for biotechnology firms needing FDA and other government approvals.

"Representatives of U.S. and foreign businesses come to call on US regulators (FCC, SEC) and other government officials, and it's easy to arrange meetings with them here."

— Claude Burgio, CEO, SkyOnline

"It's helpful to have access to Hill staff to share understandings about new economy issues like privacy, tariffs, standards."

— Art Hurtado, CEO, Invertix

"Most companies have representation here and it's possible to exchange and share opinions to make an impact."

— Andrew Czekaj, CEO, Cambridge Asset Advisors

"The Department of Commerce picked us to participate in a technology demonstration center, and the exposure has been great."

— Tim Ogilvie, Chairman, Brivo Systems

Building the New Economy

Building the New Economy

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Overall availability and quality of workforce are key draw/advantage of the region.

■ Biotechnology CEOs are the most willing to note the value of existing institutions (NIH, Johns Hopkins), but like others, they're concerned with shortage of mid-level skills and overemphasis on certification training, rather than education.

■ Communications CEOs noted value in the wide range of schools around the region to produce "flexible athletes," not just technicians. Yet they often don't recognize the assets available "on the other side of the river."

■ Industry and academic institutions still struggle with developing a coordinated approach to workforce development.

What is often unrecognized is the depth of technology programs in the region. Four area institutions alone have almost 3.9% of the nationally enrolled graduate students in electrical engineering and 3.6% of those enrolled in computer sciences graduate programs.

University	Total Enrollment 1999/2000		Enrollment Computer Science		Enrollment Electrical Engineering	
	Graduate	Undergraduate	Graduate	Undergraduate	Graduate	Undergraduate
Johns Hopkins	12496	5500	665	255	387	103
University of Maryland	8551	24638	219	2023	504	1085
George Washington University	7834	7854	314	153	132	50
George Mason University	8181	15262	339	922	197	281

Source: Johns Hophins, UMD, GMU, GWU

National Computer Science and Engineering Enrollment and Degrees

Graduate Student Enrollment (Nationally) Fall 1999

Total Science & Engineering	411,308
Total Computer Science & Engineering	144,028
Computer Science	42,560
Electrical Engineering	31,368

Source: National Science Foundation

Undergraduate Degree Totals (Nationally) Fall 1999

Total Computer Science & Engineering	62,500
Electrical Engineering	12,423
Computer Science	8,192

Source: The American Association of Engineering Societies

CEOs interviewed for this study provided strong endorsement of the expansion of the entrepreneurial environment, and the resources available for business in the region. This endorsement is coming from other sources as well.

■ Outside media are taking notice:

● Recent inclusion of the National Capital Area near the top of the CyberCities and Fortune lists of the high-tech regional strongholds; national press reporting on the Potomac Index

■ Law firms supporting the InfoComm sector are proliferating in the area:

● Wilson Sonsini Goodrich & Rosati opened its first National Capital Area office in Reston, VA, in 2000.

● The firm Brobeck, Phlegler & Harrison opened an office in D.C. in March 1999.

● San Francisco-based Cooley Godward LLP opened a new office in Reston, VA, in April 1999.

● Piper Marbury Rudnick & Wolfe added a biotechnology and patent practice in its Washington, D.C. offices in June 2000.

● Hale and Dorr expanded its D.C.-based technology practice by opening a Reston, VA, office in February 2000.

■ An entrepreneurial "ecosystem" is evolving:

● During the fall of 2000, networking events for entrepreneurs averaged 125 per month, according to netpreneur.org.

● Northern Virginia Technology Council, Indian CEO Council, High Technology Council of Maryland, the D.C. Technology Council and the Fairfax County Chamber of Commerce are among the organizations sponsoring the greatest number of events.

● "We've gone from six degrees of separation to three degrees."

— Interview Participant

■ Numerous entrepreneurs, networking organizations, and incubators are developing, although there is still less of a risk-taking culture than Silicon Valley:

● Local media is seen as having a government mentality that punishes failure.

● Entrepreneurship is viewed as being unevenly supported. Virginia is perceived as more business-friendly than Maryland, as shown in government attitudes and development cycles.

Building on the Vision - Voices of the Entrepreneurs

The availability of capital is seen as growing and reinforcing the entrepreneurial environment.

■ The number of Venture Capital firms and options are proliferating, but this area is still not as risk friendly as New York or Silicon Valley.

● More early stage capital is seen as available now, but second stage funding is hard to find.

● "This is an Angel Valley, not a Venture Valley." – Todd Ruelle, CEO Sonic Telecommunications International

■ In a sign of market maturity, the region's former high-tech start ups are spawning new generations of companies.

● Serial investors are emerging, as entrepreneurs from firms such as **Digex, AOL Time Warner** and **Teleglobe** move into new ventures.

■ The market downturn has had an effect.

● According to the PricewaterhouseCoopers Money Tree Survey, Venture Capital investments in D.C. Metroplex (Maryland, Virginia, West Virginia and the District of Columbia) declined by 29% in the third quarter of 2000 when compared with the second quarter 2000.

● With fewer investment dollars available, venture capitalists are carefully evaluating new deals.

● "We are reserving more money for existing portfolio companies rather than putting it into new ventures."   — Patty Abramson, Managing Director, Women's Growth Capital Fund

■ Experienced entrepreneurs are taking board memberships with new Internet companies and directing their management teams.

● **Nextone**, a communications firm housed in a Maryland incubator program, was formed by 3 break away Hughes Network employees with the help of the Maryland Department of Business and Economic Development (DBED), which contributed $200,000.

Building on the Vision - Evolving Trends

Building on the Vision: Evolving Trends – the transition from the dot.com era to the Internet era means core technologies are key to continued growth.

The key trends underlying the growth of the New Economy were in place in 1998 and described in terms of the National Capital Area's heritage as a leading region in the development of telecommunications and Internet businesses and their infrastructure.

These key elements have persisted:

■ Internet/web-enabling applications and integration are key drivers of growth for the U.S. computer systems integration market and for communications networks on which the Internet is run. *Fortune Magazine* has declared, "The dot.com era is over. The Internet era, by contrast, is just getting started."

■ As we start to experience the "dot.com bomb" with many companies failing to meet expectations, the National Capital Area is strengthened by its continued strong base of network infrastructure, systems, and content providers. The National Capital Area leads the nation in Internet services and continues to drive the growth of many Internet-related companies.

● Three of the top ten U.S. Internet backbone providers are based in this region: **UUNet/Worldcom**, **Cable & Wireless USA**, and **Concert**.

● Locally-based **America Online** (now AOL Time Warner) has the largest market share among Internet Service Providers, with over 27 million subscribers worldwide as of January 2001. CompuServe, Inc., which was acquired by AOL, added 2.8 million of AOL's subscriber base.

● A wide range of traditional and evolving communications technologies are based in local companies.

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Building on the Vision - Evolving Trends

The National Capital Area is home to a wide range of traditional and evolving communications companies.

FIBER-OPTIC AND WIRELESS NETWORKING IS CENTERED IN THE NATIONAL CAPITAL AREA, AND ITS GROWTH CAN BE SEEN IN THE FOLLOWING EXAMPLES

- **Ciena** by December had a stock price growth of over 190% for the year.

- **Winstar** now holds 60 metropolitan area licenses.

- **Teligent** provided service to 75 cities by the end of 2000.

- **XO Communications** serves approximately 47 cities.

- **eSpire** has 30 nationwide markets.

- **Net2000** has been certified to operate in 14 states and D.C.

- **Aether Systems** has been labeled as the "Microsoft" of the wireless data world.

GLOBAL TELECOMMUNICATIONS PROVIDERS

- **Teleglobe** provides service to 160 cities around the world, and together with **Concert**, **Cable and Wireless USA** and **GlobalOne** make this area the world capital of corporate network services.

- **Primus Telecommunications** operates in 29 countries.

Satellite Communications is an industry that was created in the National Capital Area and continues to evolve and innovate here.

RESIDENTIAL SATELLITE SERVICES "DIRECT TO HOME" INTERNET

- A rapidly evolving business, driven by consumer demand for broadband, and Internet access, combined with the access advantages provided by direct broadcast satellites.

- Germantown-based **Hughes Network Systems** initiated the first satellite ISP "Direct PC."

- McLean-based **StarBand** is offering interactive high-speed internet access via satellite.

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SATELLITE RADIO BROADCASTING

- With the development of digital audio broadcasting technologies, another new area of satellite services is evolving around radio - again centered in this region where two out of the three firms in this business have headquarters.

- D.C.-based **Worldspace** – the first global satellite radio broadcast system - now has satellites operating over Africa and Asia.

- **XM Satellite Radio** has moved into a new 150,000 sq ft facility in Washington, D.C. It features 82 recording studios and a full orchestra studio for original content.

ADVANCED BROADBAND SATELLITE COMMUNICATIONS

- The development of the next generation of satellite services needed to bring broadband access beyond the reach of fiber is centered in this area.

- **Cidera**, **SkyOnline**, **Orblynx**, **and iDirect** are all providing caching and other key technologies to give global Internet Services Providers and carriers the increased speed and capacity they need.

- **Astrolink INTELSAT**, **Loral Cyberstar**, and **Hughes Spaceway** are all developing advanced systems using broadband spacecraft to meet the needs of corporations and carriers worldwide.

MOBILE SATELLITE SERVICES

Despite many ups and downs, this service sector, again developed in the National Capital Area, is moving ahead, with the revival of **Iridium**, and the continued growth of **Orbcomm** and **Motient**.

SATELLITE IMAGING

With recent Federal decisions authorizing sale of images as detailed as a half-meter, expanded government and commercial demands are driving business growth for local companies **OrbImage** and **Core Software Technology**.

Building on the Vision - Evolving Trends

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Evolving Trends: The Birth of Bioinformatics.

The recently completed human genome map has been a key success for both government and private biotechnology enterprises in the National Capital Area, and has drawn attention to the wealth of expertise and leading position of this region.

■ Bioinformatics is emerging as a key enabler for scientists to use information technology to mine masses of biological information for medical, pharmaceutical, and other industries.

■ Rockville-based **Celera Genomics** recently announced a deal with the Australian government for access to genome database. Half a dozen other pharmaceutical companies have paid over $14 million for access rights.

■ **Human Genome Sciences Inc.** of Rockville, Maryland, is already developing its own drugs as well as selling information to drug makers.

■ "Our goal is to use genomics to generate 100 human leads that are active in cell-based experiments. From that we will choose 10 leads and test them in animal models. We plan to generate two new drug compounds a year, and will develop at least two of them in-house. So, with just a small budget — 100 million annually — we'll deliver four potential therapies a year. That's much greater efficiency than other pharmacetutical companies."

— *William Haseltine*, CEO of Human Genome Sciences

■ **Genvec** recently opened a new 43,000 square-foot corporate headquarters and research and development center in Gaithersburg, MD in February 2000. The $7.5 million state-of-the-art facility was partially funded by financial assistance grants from the State of Maryland and Montgomery County.

The Johns Hopkins University School of Medicine announced in December 2000 the creation of the Institute for Basic Biomedical Sciences. This will include $125 million investment over three years in new programs and facilities for several hundred scientists involved in genomics and proteomics (the systematic study of genes and proteins), computational biology (the use of computers to analyze biological data), and small molecule probes (the use of small molecules to treat disease and research).

"One important way in which the Federal government, in particular, has stimulated technological advance is by funding basic research - often highly theoretical work that lays the scientific foundation for commercial applications down the road. Much of the information technology revolution - the hardware, the software, encryption techniques, artificial intelligence, and the Internet itself - owes its origins to Federally funded research. A similar claim can be made for much of the commercial work that is now revolutionizing biotechnology."

— Brookings Review, January 2000

"Washington D.C. also rates highly as a high technology employment center, largely because of the area's concentration of computer science and data processing firms, many serving government agencies."

— Brooking Institution, January 2001

Evolving Trends: Recognition of the Opportunities from the Government.

The National Capital Area has a unique advantage in the presence of the Federal Government as both a resource base and a customer base.

The skills and experience gained in this local market provide a base for local companies to take a leadership position in the emerging e-government opportunities around the country and around the world. Each of these relies on the communications and computer industry strengths of the region.

E-government can be divided into three categories:

● (1) government-to-citizen interactions, such as online voting and driver's license renewals;

● (2) government-to-government transactions, in which agencies exchange information internally and with each other (i.e., states that share employment data); and

● (3) government-to-business commerce, the hundreds of billions spent each year on government procurement.

"We think that the Federal Government is going to put a lot of money into information assurance."

— John Graham, Vice President of Corporate Affairs, BTG Inc.
(*Washington Times*, March 27, 2000)

Value of Federal Government Spending
Comparison Between the Washington and Silicon Valley Economies
(in billions of 1999 dollars; jobs in thousands)

	Washington PMSA	Silicon Valley*
GRP, 1999	$218.2	$170.7
Total Federal Spending	68.4	16.9
Percent GRP	31.3	9.9
Total Federal Procurement	25.8	4.3
Percent GRP	11.8	2.5
Federal Tech Procurement	13.5	2.3
Percent GRP	6.2	1.3

Sources: US Census Bureau, Consolidated Federal Funds report, FY 1999; Dunn & Bradstreet; GMU Center for regional Analysis

* defined as : San Francisco, San Mateo, and Santa Clara counties

Building on the Vision - Resilliance of the Regional Economy

Surviving the Stock Market Slowdown: Resilliance of the Regional Economy.

■ The stock market slowdown has shifted capital away from business-to-consumer e-businesses and to infrastructure related companies that comprise a large portion of the region's high-tech sector.

● "A lot of people still like the idea of something you can put your hands on."

— Gary Arlen, President of Bethesda telecommunications research firm, Arlen Communications Inc.
(*Washington Post*, August 14, 2000)

■ This has helped companies in fields like telecommunications infrastructure in which companies received the biggest influx of capital in the second quarter.

● "Shrugging off stock market volatility and a looming economic slowdown, most local Venture Capitals see nothing but blue skies ahead for the sector."

— *Washington Business Journal*
(September 8, 2000)

● "Given that the market is down, the exits are tougher and Venture Capitalists are having to fund more rounds of their own portfolio companies. There still is a lot of money out there."

— Jane Dietze, Partner at Columbia Capital
(*Washington Business Journal*, September 8, 2000)

● Almost immediately after Microstrategy announced its corporate layoffs, corporate recruiters began barraging MicroStrategy's human resources department with phone calls, e-mail, and letters seeking information on how to contact people who were let go or had job offers rescinded. Many of these people received offers of high-level positions and salary increases of $10,000 or more.

— *Washington Post*
September 1, 2000

■ The recent slowdown in the national economy is cutting into some of the growth built up over the two years since the initial study. But one of the key elements of the National Capital Area's InfoComm industry is the core Federal Government contracting base on which much of the industry has evolved.

● "Federal purchases of technology services and products totaled $13.5 billion in the Washington PMSA in 1999 and $2.26 billion in Silicon Valley. Federal procurement accounted for 38.4% of the technology market in the Washington area but only 4.7% in Silicon Valley. This speaks to the vulnerability of technology businesses to an economic slowdown. The Washington area technology cluster is highly cushioned from external impacts."

— Dr. Stephen Fuller, George Mason University

■ Over the 1990-1999 period, the Federal Government bought $88.3 billion in technology services and products from Washington Area firms. Total procurement was $188.6 billion over this period, of which technology purchases accounted for 46.8%.

— Dr. Stephen Fuller, George Mason University

The strength and survivability of the National Capital Area's economy is also an outgrowth of the depth and breadth of sub-industries.

■ The technology job mix in the Washington area differs greatly from other centers such as Silicon Valley, further providing a cushion against market turbulence.

Sector	Washington Metropolitan Statistical Area	Silicon Valley
Manufacturing	14.1%	57.8%
Business Services	58.1%	31.6%
Engineering/Management Services	27.8%	10.6%

■ "Washington has double the percentage of service-based technology jobs at 86% than Silicon Valley with 42%. This distribution also favors the growth potential and the ability of the tech sector in the Washington Area to weather downturns. Manufacturing is the most vulnerable and that is why the National Capital Area has a more stable and stronger economy than Silicon Valley."

— Dr. Stephen Fuller, George Mason University

■ "The technology industry accounts for an estimated 16% of GRP in the Washington area compared to 28% of the Silicon Valley economy and, as the Federal market accounts for a significant portion of total technology sales in the Washington area, it is not as sensitive to externalities as in other technology centers. Also, the Washington area's technology industry is 85% business and engineering and management services (compared to 42% in Silicon Valley); these workers are easily adaptable to a wide range of jobs. This will make re-employment of these workers in case of business failures or downsizing much easier than in cases where manufacturing and technical services dominate the technology industry."

— Dr. Stephen Fuller, George Mason University

Building on the Vision - Resilliance of the Regional Economy

The early success of the InfoComm Cluster in the National Capital Area has bred greater success recently and has created challenges. If the positive elements in the region are to be retained, infrastructure concerns need to be addressed.

■ Many of the infrastructure issues identified by participants in this Study and others concern the growing traffic congestion. As InfoComm businesses move into new corridors and clusters not well served or interconnected by existing transit systems, such as the Dulles and I-270 Corridors, this becomes a critical issue.

■ The search for affordable office space and housing has pushed the center of the region further out, creating new traffic patterns and increasing transportation congestion in the outer suburbs and in the city center. Discussion among CEOs at one roundtable session summed this up:

  ● "Roads are a double-edged sword - we need them because traffic is becoming a recruiting and retention problem, but we don't want them to erode our quality of life."

  ● "We need to develop more innovative transportation solutions within technology centers."

  ● "We need more incentives for telecommuting."

■ One obvious solution to these issues is to reduce or modify the traffic flows by enabling and encouraging more employees to work closer to where they live, and making this possible by promoting more teleworking.

■ According to the Metropolitan Washington Council of Governments, in the third quarter of 1998 there were 250,000 teleworkers in the National Capital Area who teleworked 1 day per month or more -- this is equivalent to 20% of 12% of the workforce. The average was 1-2 days per week. The current target is to have 1-in-5 employees teleworking by 2005. If achieved, this would mean 600,000 people teleworking, with 185,000 (approximately 6%) teleworking on any given day.

— Commuter Connections, Fall 2000

■ The Federal Government has promoted teleworking actively since 1994, when President Clinton issued a directive to all Federal agencies mandating the use of flexible work arrangements. A PricewaterhouseCoopers sponsored study, "Managing Telecommuting in the Federal Government: An Interim Report" issued in June 2000, found that teleworking encompasses a wide variety of government grade levels, job titles, functional areas, tasks and occupations, although the majority are at government grades 12 and above - in other words senior technical and professional staff.

■ The InfoComm Cluster in the National Capital Area is more service-based than manufacturing oriented. Thus many of their activities do not require physical proximity or staff working together. The Cluster would potentially be a good candidate for teleworking on at least a part-time basis.

The role of the InfoComm revolution in creating and solving infrastructure issues

■ The InfoComm Cluster, while it has by its expansion created some of the key infrastructure issues facing the National Capital Area, has within itself the tools to help solve these issues.

  ● The InfoComm Cluster is creating many of the technologies needed for effective teleworking:

    - Internet

    - Wireless communications

    - Fixed wireless and satellite broadband access

    - DSL and cable broadband

    - Networking software

  ● Key InfoComm industry activities are themselves amenable to virtual team-working, making it possible for these key businesses to take a major role in promoting teleworking:

    - Call centers

    - Software development

This combination provides a strong recipe for success.

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Choices for the Future

The primary challenge for the National Capital Area is the need to collaborate and cooperate regionally

■ As described through this Study, the National Capital Area has a base of InfoComm companies that is broad, deep, and flexible, and an "endowment" from the Federal Government, which has served as the springboard for development and provided a solid underpinning for continued strong performance in the face of current economic uncertainties.

■ In order to achieve its full potential, the region must have greater cooperation and coordination in a number of key areas, with infrastructure topping the list.

● "There is no choice but to think of regional issues and solve infrastructure issues on a regional basis."
—George Vradenburg, AOL Time Warner

● This is consistent with the recent Potomac Index Survey in which cooperation among the three major jurisdictions was cited by over 90% of respondents as critical to meeting future infrastructure needs.

■ Managing the geographic scope and multiple jurisdictions creates a unique set of challenges for regional collaboration.

● "We have three jurisdictions, significant distances due to the large geographic area, cultural differences, a variety of legal entities, and the growth and business life cycle phases are different."
— Dr. Alan Merten, George Mason University

■ The need to embrace the changing nature of the InfoComm Cluster and the role of the Federal Government are challenges that must be addressed regionally.

● "There needs to be flexibility and willingness to redefine ourselves. Silicon Valley has reformed itself five times so far and an entrepreneurial region needs to move quickly."
— Dr. Dan Mote, University of Maryland

■ An area of cooperation often mentioned is the need for enhanced cooperation among industry, academia and government.

● "Our unfair advantage could be partnerships among government labs, industry, and universities in a triangle."
— Dr. Mote

● "Four key actions are needed to develop more interaction between the academic and corporate worlds:

- community leaders need to talk about higher education and include it in their vocabulary,
- politicians need to fund educational projects,
- business leaders need to put their money where their mouths are, and
- individuals from the university community need to be integrated into the corporate community by inclusion on boards, research projects, etc."
— Dr. Merten

Appendices

Approach & Methodology

Our methodology for evaluating the 'New Economy' involved both quantitative and qualitative elements:

■ Compiled, analyzed, and screened a database of local companies in the InfoComm sector and enabling industries.

■ Prepared a quantitative analysis to determine the size of these industries in the National Capital Area as well as the composition of industry sub-sectors.

■ Conducted roundtable and individual interviews with industry "thought leaders" in the region to identify key trends, issues of concern and success factors, and conducted a fax survey of additional CEOs representing all the geographies and industries covered by the study.

■ Examined secondary research to verify industry trends and provide background information.

The study team was led by PricewaterhouseCoopers. The Mason Enterprise Center at George Mason University provided data research. Professionals from Hale and Dorr and PricewaterhouseCoopers conducted the interviews and roundtable discussions. In addition, all the sponsors contributed material and analysis to the final report.

Approach and Methodology

Approach and Methodology

Methodology for Compiling Local Company Database.

Establishment data was obtained from the ES202 Employment Security files from Virginia, Washington D.C. and Maryland and from a commercial data supplier, Info USA. This data was sorted by SIC category and then allocated to three major industrial categories and associated subcategories as outlined below.

I. **Communications**:
   Wireline: 4813
   Wireless: 4812
   Satellite: 4812
   ISP: 4813
   Cable: 484x
   Equipment: 366x
   Communications/Other: 482x
   489x (some in Satellite/ISP)
II. **Content**:
   Traditional/Network: 271x, 272x, 273x, 483x
   New Media: 7375
   Bioinformatics: 8731, 8733
III. **Computers**:
   Software: 7371, 7372
   Systems Integration: 7373, 7379, 8711, 8741, 8748
   Hardware: 357x, 367x
   Diversified Services: 5045, 5065, 7374, 7376, 7377, 8732

Note: x refers to fourth digit in the 4 digit SIC code indicating that the whole 3-digit category was used.

Establishments in SIC 4812 were allocated to wireless and satellite communications categories depending upon the line of business. Likewise, establishments in 4813 were allocated to wireline and ISP communications categories depending upon the line of business. Also, establishments in SIC 489 were allocated to satellite and ISP categories again depending upon the line of business. Although most of the establishments in SIC 4841 were allocated to the Cable subcategory in Communications industry, a few were allocated to the subcategory Traditional Media in the Content industry. These allocations were made by a panel of Communications industry experts in the study region.

The establishment data produced a list of about 36,000 companies. This data was alphabetically sorted and then inspected to eliminate duplicates (establishments with the same address) and establishments that were not technically intense. Technology intense establishments are defined as those that produce technology, use technology intensely to produce a product or solve a complex problem.

Employment and revenue data were verified in one of the following ways: company data verification sheets faxed to firms for validation, or comparison with other regional technology databases (Matchmaker – CIT online database, PricewaterhouseCoopers, on-line fact sheets).

Employment and revenues for missing data were estimated. All establishments with both employment and revenue data were separated from those with missing data. Average employment and revenues were calculated for each SIC. These averages were substituted for establishments missing both sales and employment by SIC. Ratios (either employment/sales or sales/employment) were used as a factor to determine the missing data for establishments missing either sales or employment figures.

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Morino Institute – Netpreneur.org

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*Maryland Technology Development
Corporation*

Richard Story
*Howard County Economic
Development Authority*

Dr. Roger Stough
*Mason Enterprise Center
George Mason University*

Ken Wasch
*Software and Information
Industries Association*

Advisory Panel

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Roundtable Participants

CEOs from 60 local companies participated in roundtable sessions or individual interviews with members of the study team.

■ Each roundtable session had a mix of participants, but two were primarily composed of Internet start-ups and Venture Capital firms and one was predominantly biotechnology companies.

■ The individual interviews were conducted by partners and managers of PricewaterhouseCoopers and attorneys from Hale and Dorr.

■ Additional CEO input was received in response to the survey distributed by fax.

October 11, 2000	October 18, 2000	October 19, 2000	November 1, 2000
the Adrenaline Group	Brivo Systems	Capital Genomix	Core Capital Partners
Greg DuPertuis	*Tim Ogilvie*	*Jill M. Ray*	*Jonathan Silver*
Allied Capital	Canton Group	Chesapeake PERL	Level 3
Thomas H. Westbrook	*Kirk Grothe*	*Terry E. Chase*	*John Shuttleworth*
Dean & Co.	Celadon Labs	Genome Dynamics	Pivotry
Dean Wilde	*Raymond Peterson*	*Richard J. Feldmann*	*Brian Meshkin*
eStara	Computer Sciences Corp	GenVec, Inc.	Smarthinking.com
Tony Cancelosi	*Ben Gianni*	*Jeffrey W. Church*	*Burck Smith*
Magnet Interactive	Data Source, Inc.	Protiveris	XM Satellite Radio
Robert S. Poulin	*Pamela Hopkins*	*John P. Peeters*	*Lon Levin*
New Media Strategies	Maryland Technology	TimeBridge Technologies	
Pete Snyder	Development Corp.	*William S. Strang*	
RetailMetro.com	*Renee Winsky*	ViaCast Networks	
Jeremy Nurse		*Steven Easley*	
thinkXML		Viaken Systems	
Michael Pollard		*Keith O. Elliston*	
Washington Business			
Forward			
Jeremy M. Brosowsky			
Women's Growth Capital			
ZebraPass			
Jordan E. Klear			

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Interview Participants

Personal interviews of key industry participants further refined our understanding of the InfoComm industries and the 'New Economy' in the National Capital Area.

Interview participants

AOL Time Warner	George Vradenburg, Senior Vice President
Arbros Communications	Jonathan Flicker, Chief Executive Officer
Cambridge Asset Advisors	Andrew Czekaj, Chief Executive Officer
CareerBuilder	Rob McGovern, Chief Executive Officer
Ciena	Patrick Nettles, Chief Executive Officer
Club Essentials	Steve Elliott, Chief Executive Officer
Cvent.com	Reggie Aggarwal, Chief Executive Officer
Dimensions International	Patrick Herrity, Chief Financial Officer
dotRisk	Rick Fields, Chief Executive Officer
Draper Atlantic	John Backus, Managing Partner
Enterworks	John Wood, Chief Executive Officer
Friedman Billings and Ramsey	Russ Ramsey, President
Gannett	Douglas McCorkindale, Chief Executive Officer
George Mason University	Alan Merten, President
IMC, Inc.	Sudhakar Shenoy, Chairman
Invertix	Art Hurtado, Chief Executive Officer
LCC	C. Thomas Faulders, Chairman and CEO
Morino Institute	Mario Morino, Chairman
NetDecide	Kate Armstrong, Chief Executive Officer
Network Solutions	Jim Rutt, Chief Executive Officer
NextGen Capital	Carl Eckstein, Managing Director
NextGen Capital	Zim Putney, Principal
Oracle	Carl Kelley, Senior Vice President
Pedestal	Stuart A. McFarland, Chief Executive Officer
Pivotry	Brian Meshkin, Chief Executive Officer
Proxicom	Raul Fernandez, Chief Executive Officer
SkyOnline	Claude Burgio, Chief Executive Officer
Sonic Telecommunications International	Todd Ruelle, Chief Executive Officer
Speakout.com	Barbara Dreyer, Chief Operating Officer
Talk.com	Gabe Battista, Chief Executive Officer
Teligent	Alex Mandl, Chief Executive Officer
University of Maryland	Dan Mote, President
Varsity Group	Eric J. Kuhn, Chief Executive Officer
Venturehouse Group	Mark Ein, Founder
Washingtonpost.Newsweek Interactive	Chris Schroeder, Chief Executive Officer and Publisher
webMethods	Phillip Merrick, Chief Executive Officer
UUNet/Worldcom	Robert Hartnett, Chief Executive Officer
YellowBrix	Jace Wieser, Senior Vice President

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DISTRICT OF COLUMBIA

The Office of the Deputy Mayor for Planning and Economic Development supports the Mayor in developing and implementing the District's economic development policies and programs. The Office places a special emphasis on the information technology services sector, which is an increasingly important component of the national and local economies.

To help build upon the District's strengths as an important center of Internet-based commerce, the Office works closely with a host of industry experts, including the Mayor's Digital Capital Alliance, the D.C. Technology Council, the D.C. Marketing Center, D.C. Agenda, the D.C. Chamber of Commerce, the Greater Washington Initiative, local universities, and civic organizations. This collaboration primarily focuses on the identification of affordable facilities, and tax and regulatory policies that help to attract technology and other high-growth industries likely to contribute to the achievement of the District's principal economic development objectives:

- **Revitalize Neighborhoods** *Build and sustain vibrant and healthy neighborhoods with a variety of housing and retail developments*

- **Expand and Diversify the Economy** *Attract and retain businesses by creating a hospitable tax and regulatory structure and a clean and safe environment*

- **Provide Economic Opportunity for District Residents** *Foster growth in entrepreneurship, employment, and training opportunities for residents*

GEORGE MASON UNIVERSITY

The Mason Enterprise Center and the School of Public Policy sponsored the work based at George Mason University. The Mason Enterprise Center provides assistance to new technology business ventures and other companies in the Northern Virginia Region. It provides assistance with business plan development, market research, capital acquisition, and technology assessment through a variety of programs ranging from a series of Small Business Development Centers to its new STAR Technology Program. The Center has also developed and helps maintain courses in entrepreneurship throughout the George Mason University curriculum. For the New Economy Study, it partnered with The Center for Regional Analysis in the School of Public Policy. This Center specializes in regional economic analysis and research. Also, the GMU School of Information Technology and Engineering assisted the study through participation on the project planning and steering committee.

HALE AND DORR LLP

Hale and Dorr LLP is a leading law firm with offices in Washington D.C., Reston, Boston, Waltham, New York, Princeton, and joint venture law offices in London, Oxford, and Munich, from which it serves a regional, national, and international practice. Hale and Dorr represents a diverse group of individuals and companies, providing a full range of services in many fields, including high technology, biotechnology, retail, investment management, and real estate. The firm also has a strong commitment to public service, dating back to its founding more than 80 years ago.

Hale and Dorr has a national reputation for advising and guiding emerging growth companies, especially those in the internet, high technology, software, medical device and biotechnology areas. For the past decade, Hale and Dorr has ranked as the number one firm involved with initial public offerings.

PRICEWATERHOUSECOOPERS LLP

Drawing on the talents of more than 155,000 people in 152 countries (including more than 2,200 partners and 27,000 professional staff in the United States), PricewaterhouseCoopers provides a full range of business advisory services to leading global, national, and local companies and to public institutions. These services include audit, accounting and tax advice; management, information technology and human resource consulting; financial advisory services including mergers & acquisitions, business recovery, project finance and litigation support; business process outsourcing services; and legal services through a global network of affiliated law firms.

Of particular significance to the National Capital Area is the Technology, Info-Comm and Entertainment, and Media (TICE) practice. The number one Firm serving technology companies of all sizes, PricewaterhouseCoopers counts as clients the greatest share of the world's largest technology companies. We were advisors on more than one-third of all the technology IPOs last year and we are the auditors of more than 35% of all technology companies receiving venture funding last year. In Maryland, the District of Columbia, and Virginia more than 250 Technology, Information Communications and Entertainment and Media clients, from start-ups to industry leaders, rely on PricewaterhouseCoopers professionals as auditors, tax consultants, and business advisors. With a local team of more than 80 fully dedicated technology industry professionals, the firm offers technology companies in Maryland, the District and Virginia expertise in a wide array of services designed to help them grow.

STATE OF MARYLAND

Maryland Department of Business and Economic Development (DBED)

The mission of the Maryland Department of Business and Economic Development (DBED) is to stimulate private investment and create jobs, attract new businesses to the State, encourage the expansion and retention of existing companies, and provide businesses in Maryland with workforce training and financial assistance.

The Department also publicizes Maryland's economic advantages and markets local products and services at home and abroad to spur economic development, international trade and tourism. As part of its promotional mission, DBED supports the arts, film production, sports and other special events. The four primary divisions are Business Development, Financing, Regional Development and Tourism, Film and the Arts.

Maryland Technology Development Corporation (TEDCO)

The Maryland Technology Development Corporation (TEDCO) is an independent corporation, sponsored by the state of Maryland, whose mission is to develop, commercialize, and deploy technology to create and sustain businesses throughout all regions in the State. Established by the State legislatire in 1998, TEDCO is governed by a 15 member Board of directors, leaders in the State's technology community, with representatives from the private, university, non-profit and public sectors.

TEDCO provides access to technology, capital, facilities, and network that foster the development of a technology economy. TEDCO's programs link eerging companies with resources in universities, Federal laboratories, business incubators, and venture capital firms, and the Corporation serves as a central focus for technology activities in the State of Maryland. In 2000 TEDCO won competitive grants from the National Science Foundation and the Federal Ecomomic Development Administration, and was selected by the National Governors' Association to participate in a "best practices" academy to develop entrepreneurial policies.

University of Maryland - College Park

The University of Maryland is a national research university located in the heart of the National Capital region. With over 32,000 students from all 50 states and 120 countries, the University is the largest center of research and graduate study in the state of Maryland, and one of the largest in the country. Nationally ranked programs at the University include business, engineering, computer science, physics, and education. As the state's only public member of the prestigious Association of American Universities (AAU), the University extends its resources to the state of Maryland, the Capital region, the U.S. and internationally through sponsored research, service programs, and top-ranked educational offerings. The University directs numerous technology advancement programs in partnership with the Federal and private sectors, including the Engineering Research Center, the Small Business Development Center, the Dingman Center for Entrepreneurship, and the Office of Technology Commercialization.

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We also express our gratitude to Bowne & Co. for the production of this report.

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